THE JOURNAL OF GAS LIGHTING
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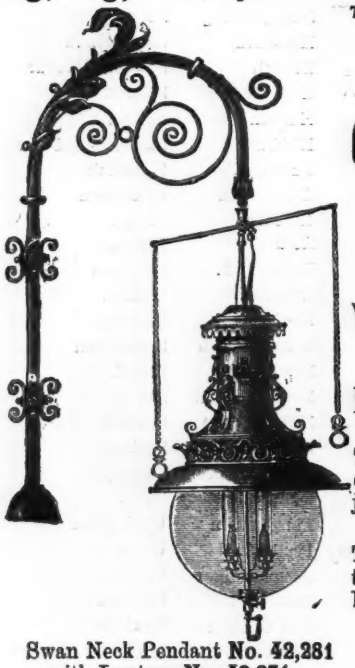

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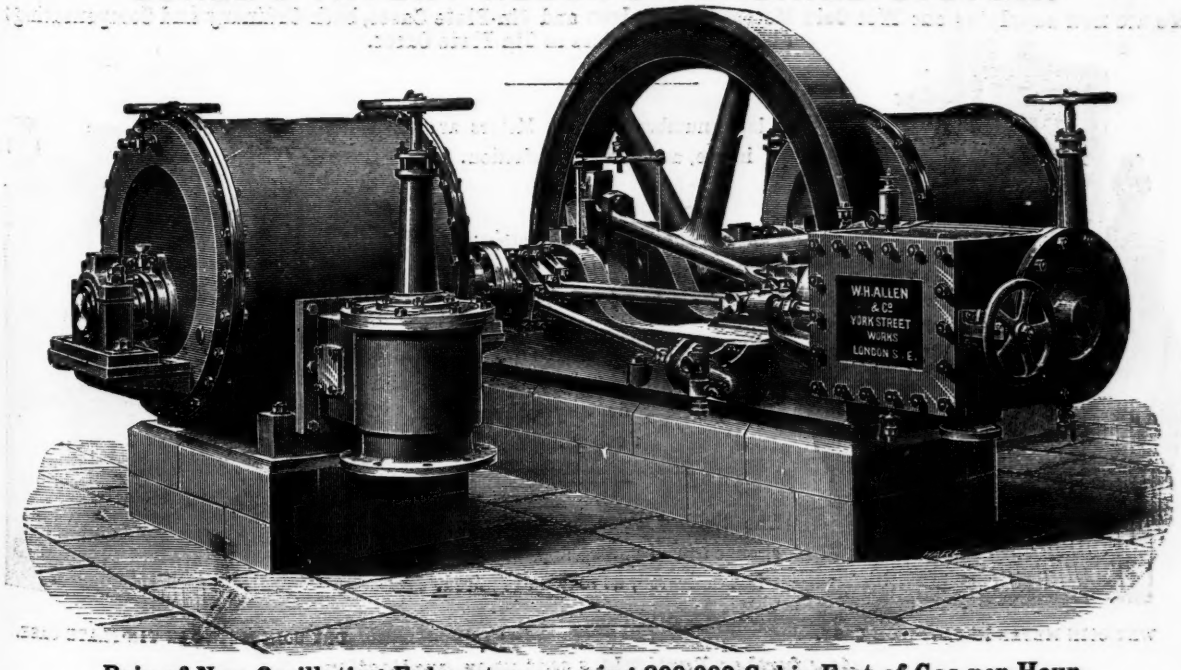

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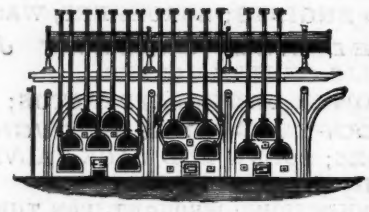

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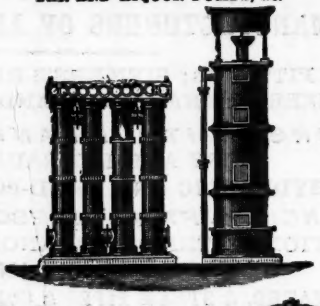

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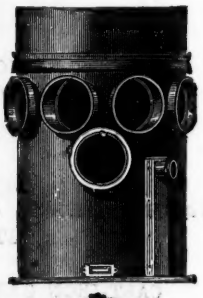

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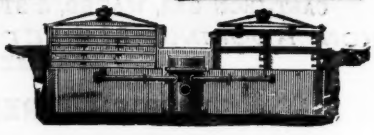

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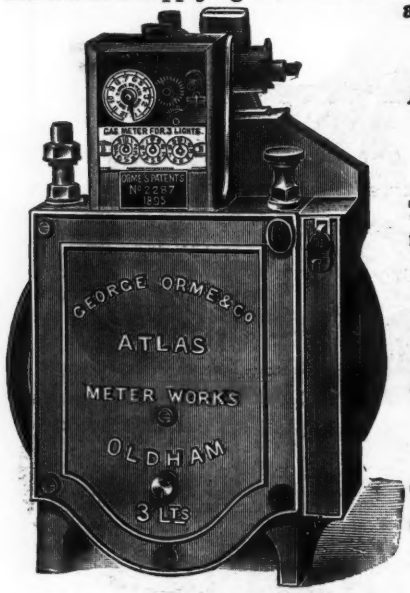

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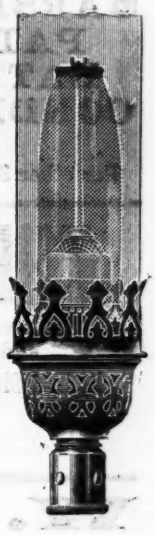

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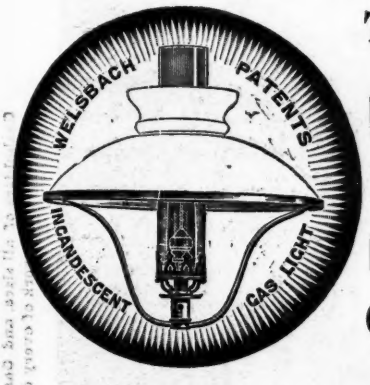

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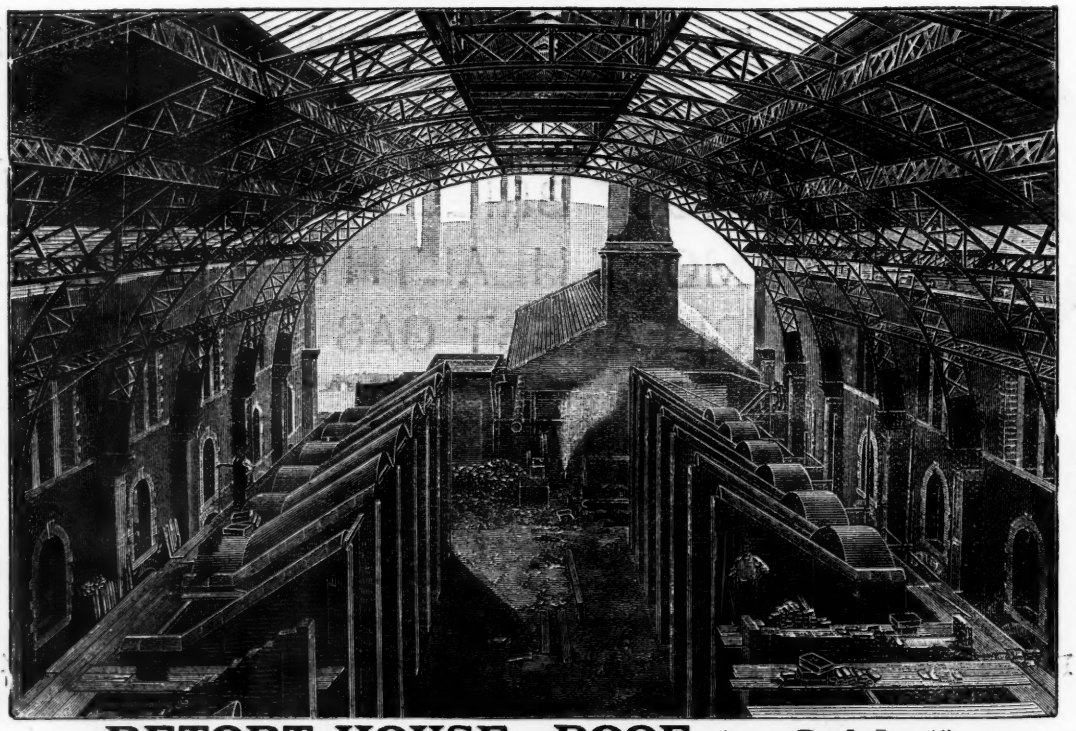

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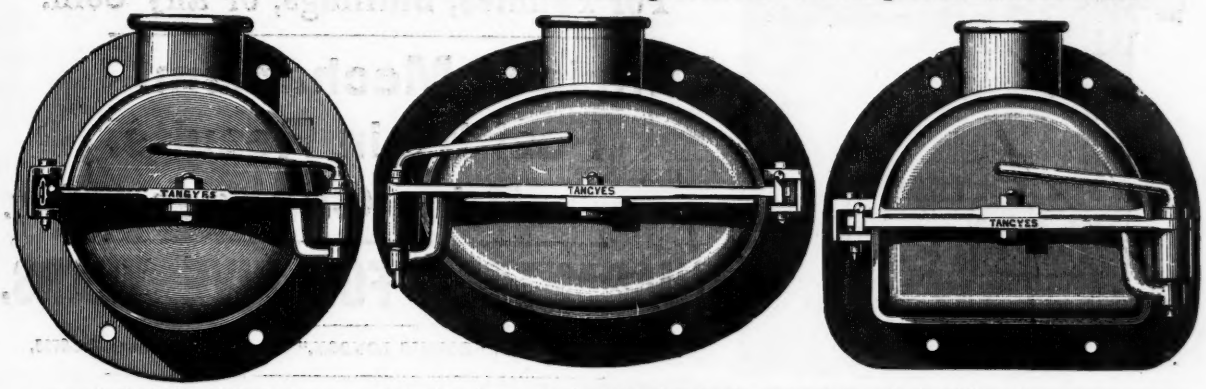

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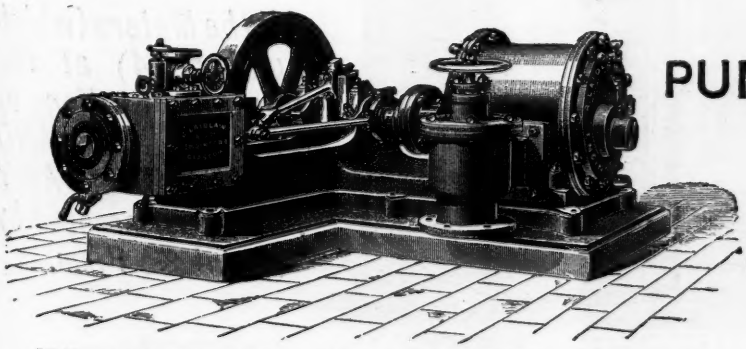

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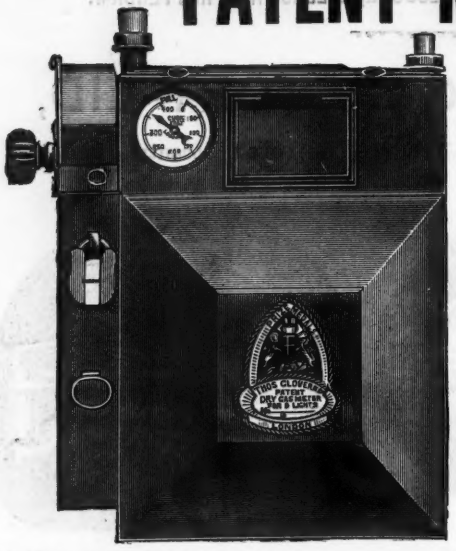

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TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

EDITORIAL NOTES.

The South Metropolitan Meeting.

THE half-yearly ordinary general meeting of the South Metropolitan Gas Company was held last Wednesday. Mr. George Livesey, the Chairman of the Company, presided, and delivered the long and interesting address which will be found fully reported in another column. Dealing with the progress and position of the Company, the Chairman first stated, in order, certain leading features of the recent history of the undertaking as calling for explanation. He admitted, to begin with, that of late years the South Metropolitan Company's capital expenditure has been large—amounting, indeed, to nearly half-a-million sterling during the past four years; and such an outlay imperatively requires justification. This was forthcoming; and, as might be supposed, it related to the expansion of the undertaking during the same period. Looking back over the record, financial and administrative, of the period selected for review, Mr. Livesey was able to show that the increased capital expenditure has been kept well within the actual requirements of the undertaking, and has been more than compensated for by the increase of business done and profit earned. In short, the profit has increased three times as fast as the expenditure required to earn it, which, as Mr. Livesey said, is the real answer to the question of justification. It is, moreover, the surplus profit on this new business that has enabled the Directors to reduce the price of gas. This demonstration of the excess value of new growth to an old gas undertaking is a very favourite exercise of Mr. Livesey's. He has shown on a previous occasion how this same growth was competent to defray the whole cost of the new East Greenwich works, without their sensibly costing the proprietors a penny; and the latest illustration in point is quite as striking in its way.

The case of the prepayment meter supplies was also handled by Mr. Livesey. This branch of the Company's business has assumed a volume which no one would have expected when it was started. It is notorious that at the beginning, and for a year or two afterwards, some observers of the new departure thought it would turn out to be a "flash in the pan." The fact of 50,000 new and additional consumers having been placed upon the South Metropolitan system by this novel agency, is a sufficient answer to this line of criticism; and it constitutes a plain proof that the coin-freed meter satisfied a certain want, though nobody was aware of the existence of such a need until the means of supplying it were offered. It is also plain that to enter upon a line of business fraught with such large possibilities was a serious matter, and involved the undertaking of responsibilities that could only be borne by properly grounding the venture upon sound financial principles. To put it shortly, it was necessary to settle the scale of automatic supply charges so as to enable the Company to face with confidence any possible run that might occur upon the resources which would have to support the system. It speaks well for the wisdom of those who had to advise the Company in this matter, that there has been no check to the development of the new department. Mr. Livesey explained how the Company are dealing with the automatic prepayment consumers; but he did not say—what is nevertheless of cardinal importance—that the successful working of the system to the Company, as well as to the consumers, is due to these several influences. First, there is a sufficient margin of charge over the normal price of gas to pay the extra expenses; secondly, rigid and watchful economy of capital outlay and cost of supervision and maintenance; thirdly, an active and lively interest in the success of this and every other part of the Company's concern, shown by every official and servant on the staff—all working together to one end, without jealousy or clashing.

On the subject of the Company's profit-sharing scheme, the Chairman was naturally optimistic. It is somewhat of a shock to be reminded of the fact that the arrangement has actually been in operation for seven years, which ought to be a certain guarantee of success. The Directors have every reason to be satisfied with the working out of the experiment; and the extent to which the Company's workpeople have benefited by it is not measured by the amount of their investment in the Company's stock, considerable as this is. Where, it may be asked, is the Trade Union, with anything like the same membership as

hat of the South Metropolitan staff, which has accumulated financial strength at the rate of £10,000 a year for seven years? This is a perfectly legitimate way of looking at the figures, although the Chairman did not find it necessary to go into such a line of argument for demonstrating the value of the scheme. The point is, of course, that the officials of a Trade Union having a balance of £70,000 to the good would be "spoiling for a strike," and would be "neither to hold nor to bind" in their behaviour; whereas the same investment under the South Metropolitan profit-sharing scheme is by way of being an insurance against strikes. Mr. Livesey's references, towards the end of his speech, to the action of the House of Commons in regard to the famous workman-director project, are deserving of sympathetic consideration. Whatever one may think of this development of the profit-sharing scheme, it is obvious that the House of Commons Committee, in retaining the form of the Directors' plan, and insisting upon raising the qualification to the impossible figure of £350, perpetrated a gross piece of absurdity. They might have struck out the clause altogether, which would at least have been consistent; whereas the course they followed was merely of a piece with that kind of make-believe popularism which is the curse of contemporary politics.

There is not really much to be said about the Company's new Act of Parliament. It is one of those things which are of more practical weight than controversial interest, after they have become accomplished facts. The Chairman's account of the Directors' battle with the London County Council was amusing, if somewhat melancholy, to reflect upon. It is not pretended that the Company have done anything to offend the County Council; yet the opposition offered to them on the part of this most arrogant of local authorities was of a most strenuous character. This is not reassuring for those who at any time may be placed in the Company's position, and may entertain ideas respecting their duty to the public differing ever so slightly from the "Progressive" ideal of the moment. The South Metropolitan proprietors have much reason to be thankful for the Act they have obtained, in view of the circumstances.

The Fate of the Dublin Corporation Bill.

Those who, with ourselves, have entertained strongly adverse opinions as to the necessity and expediency of the legislative schemes of the Dublin Corporation, will have received with a grim joy the news that the Dublin Corporation Bill of this year has been lost when almost within sight of the goal of Royal Assent. True, the Bill that had got thus far was not the measure that started so portentously from the law office of the Corporation. As our readers have been informed, it was originally a Bill for making all sorts of alterations in the arrangements for the local government of Dublin and the neighbouring townships; and in particular it contained certain egregious gas clauses designed for the "ruination" of the Alliance and Dublin Consumers' Gas Company. These clauses were also supposed to render the Bill more palatable to the Dublin public, who were shrewdly suspected in Corporation official circles of regarding it as a mere device for spending the ratepayers' money for the benefit of the ruling clique. At any rate, the gas clauses were the first to go—struck out by the House of Lords Committee without calling on the Company for their defence. The water clauses remained, with little else; so that it was merely a Water Bill when it reached the House of Commons Committee. This Committee, however were instructed to insert provisions dealing with the municipal franchise of Dublin. They did so, with the result that the Bill as amended was not covered by the terms of the original notices. Moreover, as the Bill originated, in the parliamentary sense, in the Upper House, and these amendments, which were never contemplated in the first instance, were introduced in the House of Commons, it was impossible for anyone who wished to oppose to be heard in the House of Lords. This difficulty proved to be insurmountable. The Earl of Morley, Chairman of Committees of the House of Lords, had to ask the House on constitutional grounds to take a course which involved the sacrifice of the Bill; and this course was followed. Before the end was consummated, however, the much-tried Bill came once more before the House of Commons, which was asked to suspend the Standing Orders so that it might be saved. This occasion was seized upon by an Irish member belonging to the section of Irish politics which does not dominate the Dublin Corporation, for impeaching the good faith of the majority that promoted the Bill. A lively debate ensued, with the object, as it appeared, of fixing upon somebody who was not present the responsibility for the state of things that had come to pass. But, naturally, the only clear result was the sacrifice of the Bill, and of all the money that has been spent upon it. The small excitement caused by the vagaries of this most irregular Bill at Westminster, however, was as nothing compared with the feeling its fate has created in Dublin. Two years' scheming and the expenditure of at least £12,000 have been lost; and Dublin wants to know the reason why. A return is ordered of the full costs of the deputation of members of the Corporation who attended in London to look after the Bill; and when this is presented to the Town Council, there will be a lively time.

Meanwhile, it is almost superfluous to state that further litigation is to be proceeded with, as between the Dublin Corporation and the Gas Company, over the question of testing. The Corporation Gas Examiner has reported a series of bad tests of the Company's gas since the decision of the House of Lords Committee. It appears that the most this ingenious personage can make of the gas supplied to the official testing-station is 14·5 candles, while the Board of Trade Examiner (Dr. Tichborne), testing at the same time in an adjoining room, made it 16·89 candles. On another occasion, under similar circumstances, the Corporation Examiner found 15·2 candles, as against Dr. Tichborne's 16·83 candles. The Company wrote to the Lord Mayor protesting against this persistent depreciation of their gas; and a rejoinder was forthcoming from the aspersed official, which was more impudent than convincing. An Alderman went very near to the source of these troubles when remarking, at the last meeting of the Council, that "as "long as Mr. Cotton stopped in one room and made "tests, and Dr. Tichborne in another making tests, they "would not know what to do." He concluded his observations with a resolution instructing the Gas Committee to prepare a test case, and take proceedings with a view to bringing matters to an issue. This resolution was adopted; and consequently, unless the Gas Committee are able to do another wriggle, there is now some prospect of Mr. Thomas J. Cotton's competence and impartiality as a gas examiner being brought before a proper tribunal. This is really an initial gain for the Gas Company, who have over and over again vainly challenged the Corporation to prosecute them on the evidence of the bad reports furnished by the City Gas Examiner. The situation thus created has long been intolerable for the Company, who must rejoice that an opportunity is at last to be afforded for clearing it up in one way or the other.

Meeting of the North of Ireland Association.

The members of the North of Ireland Gas Managers' Association held their annual meeting last Tuesday at Holywood, under the presidency of Mr. T. Frizelle; the attendance being good, and the business done creditable to the Association both in quantity and in quality. A proposal was submitted by the President, and accepted by the meeting, for the granting of a gold medal annually to the author of the best paper contributed to the meeting. This proposal was supplemented by an offer of a silver medal by Professor Ivison Macadam for the second-best paper, provided that at least four papers are sent in. It was considered by several members that if a first prize medal were awarded, there should be a second; but one or two difficulties arose in this regard, which were settled in the manner stated. There are, of course, two sides to such a question as that of the expediency of attempting to encourage the writing of papers by the offer of money or other prizes. It is probably correct to hold that while the offer of an award may not be efficacious in evoking good papers, still the pains, and in some cases the actual expense, necessitated by the preparation of a really valuable contribution may be fittingly recompensed in some tangible fashion. Without desiring to cavil at the decision of the North of Ireland gas managers in this regard, we yet venture to opine that in this case a cheque would serve their turn more appropriately than a gold medal. There is a pretentious sound about the latter form of reward, which seems much better suited to the acknowledgment of merit of a more enduring and conspicuous character than can always attach to the writer of a North of Ireland Gas Association paper, be he never so worthy

of distinction in his year. The presidential address of Mr. Frizelle was quite in accord with the requirements of the place and the occasion. Papers by Mr. W. Miller, of Cookstown, and Mr. A. Gibb, of Newry, were read; and an interesting informal discussion was initiated by Mr. P. J. Salmon, of Galway, who is in many ways a pillar of strength to the Association. Professor W. Ivison Macadam delivered a lecture, the text of which will be found in another column, on "The Chemistry of Ammo-"niacal Liquor." But the lecturer's conclusions on the commercial side of the question of sulphate manufacture are not likely to command universal assent. The Association was hospitably entertained by the Holywood Gas Company, represented for the purpose by Dr. Johnston and Mr. Wilson, Directors. Next year's meeting is to be held at Omagh, under the presidency of Mr. M. Martin, of Drogheda. The proceedings, on the whole, were of an interesting and useful cast, and amply repaid the members for journeying to Holywood.

The Trouble at Messrs. Thornycroft's.

The remarkable labour dispute at Messrs. Thornycroft's Chiswick yard, mentioned in this column on the 28th ult., has at length been composed by an award of Sir Benjamin Baker, whose appointment as Arbitrator was mutually agreed upon by the high contending parties after the original Arbitrator declined to act. As already explained, the nature of the dispute might almost be summed up in the terms of a conundrum: When is a boiler not a boiler? For the Boiler Makers' Society contended that so long as boilers are to be made, it is their prerogative to make them; while the Amalgamated Society of Engineers argued that, boiler or no boiler, a job of tube-fitting was theirs, and theirs only, by all the canons of Trade Unionism. It appears, however, as is usual in these disputes, that the ground of contention became shifted by the time the issue was definitely framed for the consideration of the Arbitrator. According to the first showing, the difference between the two Trade Societies was of the same nature as the familiar difficulty that would arise were an "irresistible body to encounter an immovable obstacle;" and while it lasted there was no other result possible than chaos, represented in this instance by the stoppage of work in the yard. As a matter of fact, neither of the combatants in this case desired the indefinite continuance of a state of things that would probably have been determined from without by the closing of the yard to Trade Union labour. So they framed a reference on thirteen points, which the Arbitrator has been able to dispose of in a manner satisfactory to all the parties concerned, which is highly gratifying. Not only have the points in dispute been settled, but an agreement has also been arrived at between the two Societies, setting forth the lines upon which all disputes as to demarcations of work shall in future be adjusted. It is proposed that certain shop delegates, duly elected, shall be in readiness, when such questions arise, to give them consideration, and to bring them under the notice of the employers; the firm being at liberty meanwhile to make whatever working arrangements they may think best pending the settlement of the particular question at issue. The two Societies interested in the matter will meanwhile arrange for a reference to an arbitrator, whose decision is to be binding. This arrangement is to extend throughout the whole shipbuilding industry, so far as the Boiler Makers' and Engineers' Societies are affected; and it is anticipated that it will prevent any repetition of the demarcation strikes that have had such disastrous effects in the past. Such a settlement does equal credit to those who proposed it and those who accepted its terms. It has been the cue of the majority of commentators on the Chiswick strike to write of it as though it imperilled the supremacy of the British shipbuilding industry. Reports have been spread concerning orders that have gone abroad because English firms included strike clauses in their tenders. There is not much, after all, in this point. If German or other engineering firms choose to take the risk of entering into contracts binding them to complete within a specified time, under penalty, without reference to the eventuality of strikes, this does not mean that their example is to be followed by British firms with different labour conditions to face. Really what was in peril in connection with the Chiswick strike was the possibility of carrying on work of the kind under Society auspices; and it behoved the leaders of the Trade Unions to show that they possessed some sort of power to compose their internecine disputes so as to permit of business being carried on. Otherwise the firm must have closed their doors entirely, or have closed them to Society men. It is obvious which alternative would be first tried.

WATER AND SANITARY AFFAIRS.

The First Lord of the Treasury, in answer to a letter from Mr. Lionel Holland and ten other Members of Parliament representing East London constituencies, stated last week that the Government are "deeply sensible" of the importance attaching to the question of the water supply, as affecting London generally and the East-end in particular. Hence the Government "strongly feel that "next session ought not to pass without a solution of the "question being arrived at." Some insight into the meaning of this statement is perhaps to be obtained by a consideration of the letter to which it is a reply. Mr. Holland and his colleagues asked, with a view to prevent any further failure in the water supply furnished by the East London Company, that the whole supply of water in the Metropolis should be placed in the hands of one authority, so that, when scarcity arose in one district, it might be met by that which could be spared from other districts. The one authority was to be of a public representative character; and the Government were urged to bring in a Bill next session for the purpose of effecting such a change. It was further asked that the Bill should be brought in at an early period of the session, and should be followed up "with a determination to pass "it into law."

The Government are thus urged to be prompt and earnest in taking steps for creating the requisite authority. The machinery is to be set up; and then the work is to be done. This implies that the authority which should take charge of the supply is not yet constituted. A preliminary stage has, therefore, to be gone through. After that, there is to be the consolidation of the supply; the whole to be possessed and governed by the one power which will have been established. The Government are not asked to accept the County Council as the authority which is to be thus placed in command. Neither is it proposed that the terms of purchase shall be laid down in the Bill. It is apparently intended (or at least allowed) that the newly-created body shall itself face the question of purchase; Parliament being in a position to decide on the merits of any bargain that may be entered into. How far the Government will be found prepared to act on these lines, is only to be inferred by the terms of their own Metropolitan Counties Water Board Bill, and by the Ministerial statements which have been made in support of that measure. The letter from the East London members is very much in accordance with the plan of the Water Board Bill; the only apparent divergence being in the request that the new authority shall be "of a public "representative character." We find it argued that the Water Board designed in the Government Bill would not be directly representative of the public, but would consist of delegates from other bodies—such as the London County Council, the City Corporation, sundry outlying County Councils, and the Conservators of the Thames and the Lea. Yet the County Council might not be wise in arguing that direct election would be the proper course, if an independent Board is to be constituted. It might under such circumstances come to pass that the County Council would find small footing in the new body, and would be far from possessing the majority (though slight) offered to it in the Water Board according to the Government scheme. Of course, the County Council will demand entire possession, and will pose as the pre-existent constituted authority—a position which we apprehend is not very likely to be granted to it. The Progressives contend that the Water Board Bill is dead. Yet it is impossible to ignore the fact that it represented the views of the Government when it was brought forward, and in the main must be supposed to do so still. At all events, we are now face to face with a determination on the part of the Government to grapple with the Metropolitan Water Question in some way. Unless a great political convulsion should intervene, the session of 1897 may be expected to

bring with it important issues affecting the position of the London Water Companies. But it may be observed that the Water Board Bill provided for the action of the Board in promoting a measure for the purpose of acquiring "or controlling" the undertaking of any Metropolitan Water Company. How far the Government may adhere to the idea of control is, of course, a matter on which we can scarcely speculate at the present time. Yet it cannot be considered certain that this alternative will be refused consideration.

The eleven members of Parliament from the East-end have one very distinct object in view—the prevention of a water famine, or anything approaching to it, in the East London district, by the plan of bringing all the water resources of the Metropolis to bear on any one point. But this is an object capable of being attained without wiping out the Companies. Existing mains may be connected, and new mains may be laid down, which shall form the present districts into one complete system. The East London Company drawing from the New River on the one hand and from the Thames on the other, is some example of this. The pecuniary arrangements to be made in connection with such a combination of resources are little else than a matter of detail, and involve no difficulty which the Companies would not readily surmount. A *quasi*-amalgamation of this kind is one which might have been effected in what we should call the immediate past; but though it may be apparently too late to attempt it now, it might be worth while to keep such a plan in view—partly for the reason that it meets all the argument on which the eleven members base their appeal to Her Majesty's Government. On the peg of a mere inter-communication of mains hangs all the demand now made for superseding the London Water Companies by an authority yet to be. As to the form which is likely to be given to that authority, a daily contemporary states, with considerable amount of confidence, that the Water Bill for London, to be introduced by the Government in the coming session, will be on the lines of Lord James's Water Board Bill, but practically placing the control of the water supply in the hands of the London County Council, in conjunction with the other County Councils within the area of "Water London." We fail to observe much distinction between this scheme and the outline of Lord James's measure. The Government Bill brought in the outlying Councils, and at the same time gave the London County Council sixteen representatives out of thirty. The coming Bill might propose a larger majority for the London County Council, in order to conciliate that body; but, for the present, any such intention is not likely to be declared, supposing it to exist. On the whole, though a considerable amount of contempt is expressed in certain quarters concerning Lord James's Bill, there seems little likelihood of any material departure from the plan which it laid down. Even the statement to which we have thus referred points in that direction.

A painful incident in connection with the present crisis consists in the serious illness of Mr. Bryan, the Engineer of the East London Company—a result due to anxiety and toil, aggravated—as "The Times" of yesterday expressed it—"by the malevolence of a section of the Press" directed against "a man unaccustomed to be made the "sport of political interests."

OBITUARY.

Mr. J. W. Gray, late Water Engineer of the Birmingham Corporation, died at his residence at Leamington last Friday, in his 68th year. He was born at Montrose, and was at one time located in London—first in the service of the New River Company, and subsequently in that of the East London Water Company. One of the changes brought about while he was with the New River Company was the abolition of the high and low level system. In 1865, he obtained the post of Engineer to the Birmingham Water-Works Company, whose undertaking was acquired by the Birmingham Corporation in 1876. The growth of the city was so rapid that the question of the water supply was always a source of anxiety to the Committee; and finally it was decided to seek additional supplies in North Wales, at a cost of several millions. Mr. Gray was to have taken charge of the section of the work between Birmingham and Hagley. But his health failed; and in the autumn of 1894 he sent in his resignation. This was accepted, and he was granted a retiring allowance of £600 a year—his services being still available as Consulting Engineer.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 331.)

The Stock Exchange breathes more freely. First, the settlement last week, which had been regarded with some apprehension, was got through without a difficulty of any importance. Then there was a considerable recovery in the American market, as there always is in every market when the pendulum has swung too hard in the opposite direction. People are taking a calmer view of the silver danger. For ourselves, we have too much confidence in the good sense of the nation at large—who vote, but do not make a noise—to fear their being fooled into backing the silver fad. Then foreign affairs looked better; and, indeed, things all round were rosier. Prices thus show a nice advance upon the opening figures; and not the least in point of improvement was the gilt-edged class (headed by Consols), as the great strides made by the debenture issues of the Water Companies will illustrate. The Money Market remains very easy. Business in the Gas Market was very much more quiet, though not unusually so for the time of year. The general position continues firm, although several quotations appear slightly lower. These are almost wholly the result of changes of quotation *ex div.*, some of which seem roughly done by rule-of-thumb; so that of two stocks of equal value, one appears better and the other worse. In Gaslights, there were but few transactions in the "A;" and though prices were steady, the quotation was put down a point on Wednesday, only to be reinstated on Friday. The closing price was 317 *ex div.* Nothing at all was marked in the secured issues. In South Metropolitan, there was a single transaction in the "C," at 355. This was on Tuesday, and was the last thing done in the old stocks. They are now extinct, and the 4 per cent. ordinary stock reigns in their stead. This is not yet officially quoted; but we believe it has been done at 140. Commercials were not dealt in, and were unchanged. There was scarcely any variation in the Suburban and Provincial division; but a transaction in Bristol sent the price up a point. The Continental group were rather quiet, and movements were irregular. Imperial fell back a little; but European partly paid had a rise. None of the rest were affected. Business in the Water Companies was slack; but important changes took place—the general status of their secured issues being revised. The effect of this will be seen on reference to the list at page 331.

The daily operations were: Business in Gas was quiet on Monday; but prices were pretty good. In Water debenture issues, East London rose 10; West Middlesex, 8; Chelsea, 7; Lambeth, 5; and Grand Junction, 3½. In the preferences, Southwark rose 3. Transactions were again extremely limited on Tuesday, and quotations did not move. On Wednesday, nothing was touched but Gaslight "A," which commanded a very fair price, but yet was put down 1. There was a shade more activity on Thursday. Changes in quotation were confined to *ex div.* variations. On Friday, the price of Gaslight "A" was better; and the quotation advanced 1. Imperial Continental was 1 lower. Saturday was the usual quiet day; the only change was a rise of ½ in European £7 10s. paid.

THE AMERICAN CASE AGAINST MUNICIPALIZATION.

At the recent Street Lighting Convention held at New Haven, Connecticut, the case against the municipalization of gas and electric lighting undertakings was presented by Dr. Allen R. Foote, a writer on economical subjects whose labours for the edification of the American public have on previous occasions been noticed in the Journal. On the present occasion, Dr. Foote refers to some of this earlier work, in which he laid stress upon the development of the use of thoroughfares as forming part of the serviceable equipment of modern communities. Originally made for the sole purpose of facilitating traffic, a town thoroughfare is regarded, according to this doctrine, as properly convertible into a means for supplying many other municipal requirements. From this view, it follows that the right of ownership of a thoroughfare creates the corresponding duty so to use it as to promote the greatest public good. The supplying of public needs by making special uses of municipal thoroughfares is as essential to the prosperity of municipalities and their constituents as the existence of the thoroughfares. Hereupon Dr. Foote lays down the further proposition that a special use cannot be effective unless it is exclusive. "Constructions for supplying perpetual needs cannot be scientifically erected and administered unless the term of service is coexistent with the need. Experience teaches that the economic law of labour and property cannot be obstructed by legal enactments without injury to the best interests of the wage-workers and persons of small incomes. The most powerful factor in obtaining a supply for public needs is the right to make a special, exclusive, and perpetual use for the purpose of the realty and the thoroughfares on which the plants and service constructions must be erected or over which the service must be carried. No person has an economic right to erect a structure

of the best or most durable class on realty held by an imperfect title. No State has a right to expect that it can induce corporations or individuals to supply public needs, on the best economic terms, unless it grants a perfect title to the use of municipal thoroughfares for the purpose required."

This is a very generalized way of stating the case for what is called a monopoly of service. But it means no more, when analyzed, than a claim that if the service is to be the best and cheapest possible, it must be permitted the advantage of the best and most economical conditions of existence. Again, Dr. Foote drives home the same point by arguing that, as one of the fundamental economic expectations of the wage-worker is that honest, faithful, and capable public service shall entitle him to his place and opportunity for employment for as long as he desires to keep it, so honest, faithful, and capable service rendered to the public is a fundamental requirement for securing the public good. "The intelligent self-interest of the municipality requires that this economic expectation be respected in all its public employments." Economic science is, in Dr. Foote's view, the science of intelligent self-interest; it is the science of so controlling this natural force as to cause it to produce the greatest good. It is the only science through which the natural laws of self-interest can be understood, and by which these laws can be intelligently applied, to cause this natural force to make the greatest possible contribution to the well-being of society, and its individual units.

Dr. Foote goes on to show how the self-interest of individuals produces and is merged into corporate self-interest. So a municipality becomes a political and industrial monopoly, in which way only can the self-interest of its constituent individuals be properly subserved. Municipal self-interest demands that every municipal need shall be supplied with the best service at the lowest cost that can be obtained by the use of the best-known methods. Nothing can be more paradoxical than the conduct of those who most loudly and most unintelligently condemn industrial monopolies, in which form services are rendered under the management of the most capable, while they advocate municipal monopolies, in which form services are rendered of the least capable. There never was a partisan of the municipalization of everything who admitted the suggestion of competition in regard to these services. Municipalization means monopoly on the face of it; but those who tacitly accept this are frequently unable to see that the economic advantages of monopoly are something quite apart from the question of who should apply them in the public service—the municipality itself, or a body of commercial undertakers of the service. The whole issue is thus narrowed down to one of expediency, in the supreme interest of the public service. Monopoly being the cardinal economic condition for the rendering of the best service, it is for the State to see that this condition is preserved to the organization that can make the best use of it.

Dr. Foote insists upon the fundamental importance of regulating public action in this matter primarily in the interests of the users of the service, whatever it may be. He asks what would it be to the advantage of any city if it could be clearly demonstrated that the municipal services of all kinds were better rendered, and at lower cost, than similar services in any other municipality in the world. The immense importance of such advantageous conditions, if realizable, appears greater the more the idea is contemplated. Yet Dr. Foote declares that numberless millions of money, collected from taxpayers, have been expended by municipalities in the endeavour to secure these advantages, without the attainment of the desired result. Reverting to industrial organizations for performing public services, the author also declares that the legislation by which such organizations is governed, has not proceeded on the lines necessary to secure the best economic results and the most perfect satisfaction of the public needs.

"True economic conditions require that the plants by means of which public services are rendered, shall be constructed in the most substantial manner, employing the best material for the purpose of its use, in accordance with the best engineering skill. . . . To justify the best construction, and thereby to secure services at the lowest obtainable cost for the users, there must be an undisputed, exclusive, and perpetual right to supply the services, guaranteeing an undivided and uninterrupted demand. The greater and the more concentrated the demand for a service is, the better can the facilities be afforded for supplying it, and the lower the price at which it can be rendered." All this is sound doctrine; but it must have appeared strange in the ears of the majority of Dr. Foote's audience.

He hammered away at his demonstration, however; further contending that an industrial organization doing the public service must be free from all unnecessary obstructions, charges, or disqualifications. "Unnecessary obstructions placed upon, and taxes exacted from, industrial corporations can have but one effect, and that is to maintain a greater degree of cost than need be to the users of the services. These services are assistances to industry, promoters of comfort, and inducers of prosperity. . . Unnecessary restriction and taxes laid upon municipal industrial corporations are like rust upon a plough, or a hole in a grain sack. They narrow the depth of soil turned, and lessen the quantity of seed to be sown. As the value of the harvest is greater than that of the seed, so is the increased value of cheapened public services greater than that of the taxes that enhance their cost." This is somewhat rhetorical; but there can be no doubt that in the last words Dr. Foote exposes a great and growing heresy in regard to the overtaxing of gas and other necessaries of town life. Why, it is asked, should gas-works not be highly rated, seeing that it is all the same in the end whether the supply costs to the consumer a penny or two more or less per 1000 cubic feet, inasmuch as the public pay for all? On the face of it, there is a difficulty in meeting this specious argument; because it is undoubtedly true that if the rates on a gas undertaking are put up on assessment, it merely means that the price of gas must be increased, or—what is more frequent—is prevented from being reduced. Why should not the local authorities rejoice in the appearance of low rates, instead of the gas-supplying authority take credit for cheap gas? Dr. Foote supplies the reason. It is because cheap gas is, in a sense, one of the raw materials of a town's prosperity, which is tantamount to saying that it ought to go tax-free into the widest possible use. As it happens, however, that the gas supply of a town is not wholly to be regarded as raw material for industrial and commercial treatment, it is fair to tax it reasonably. There is no law to prevent an English town owning its own gas-works from making the gas bear all the local rates; but the good sense of the administrators acts as a deterrent from this course of action. Dr. Foote declares that the right tax to be put upon industrial supply monopolies is to require the provision of a service capacity in excess of actual demands, and of extensions of the service beyond present paying limits; thus causing them to help in improving and securing the ever-widening limits of the municipality, increasing and diversifying the industries of the inhabitants, and contributing to their comfort and prosperity.

The author observes that when municipalities obtain franchises for any undertakings, these are invariably unrestricted, exclusive, untaxed, and perpetual, with an undisputed right of way. In so far as an industrial undertaking of the same kind is treated differently, and less advantageously, its condition compares unfavourably with that of the former. This superiority, and the easy terms on which money can be borrowed on the security of the rates, give municipalization a recommendation, in the eyes of the unthinking public, which it does not in reality deserve on its merits. "Political corporate (*i.e.*, municipal) ownership and management does not utilize the natural force of self-interest legitimately. Industrial corporate ownership does. The users of the services rendered under such management gain the benefit of the economic value of self-interest. The cost of services to users, furnished at the cost of production by political corporations, all factors of cost being duly considered, is greater than the necessary charges for the same services rendered by industrial corporations." It is contended that the difference, representing the value of the element of self-interest in the production, is wasted when a profit-producing industry is transformed into a non-profit-producing one; such waste being a loss of energy. "The utilization of the economic value of self-interest will create sufficient margin for profit to induce industrial corporations to undertake to supply every public service, if these corporations are granted the same conditions in their franchises as those given by the State, without question, to political corporations."

Having endeavoured to show that municipal ownership of supply undertakings is wrong in principle, Dr. Foote perceives the necessity that consequently falls upon him of proving that it is predoomed to failure in practice. Accordingly, he refers to the scandal of municipal administration of the gas supply in Philadelphia, and to the economic failure of electric lighting in several other American cities. The former is rather an old story now; but, as a matter of fact, gas supply in the United States has not been municipalized to anything like the extent of the younger system of lighting. The most important of Dr. Foote's observations on the records of the latter proceedings is that—like certain local authorities at home—American municipalities that go in for electric lighting on their own account are culpably negligent in the matter of allowing depreciation.

All this is, of course, very true; but it is equally correct to say that Dr. Foote has not exhausted the subject, while he has left himself open to attack in several places. Notably, his main argument against municipalization would apply almost as much to street cleaning, and quite as much to water supply, as to gas or electric lighting. This was noticed at the Convention, and taken advantage of by some speakers and corrected by others. Thus, to the contention that municipalities can supply gas and electric light as well as they can water, it was justly replied that the elements of manufacture, of artifice, of commercial purchase and sale, make all the difference between the two former undertakings and that of water supply. Lastly, the words of one of the speakers may well be commended to the attention of those "progressive" members of local authorities at home and abroad who are inclined to embark in electric lighting and other speculative businesses. "Private companies take their chances. If a revolution comes, their investment goes; but for aldermen and councilmen, selectmen and town councils, to spend the money of unwilling taxpayers for such a purpose, is to force a large portion of the community into a hazardous business, not strictly or properly connected with municipal administration against their wishes and without their consent." This warning was reinforced by many examples of disastrous municipal meddling with electric lighting contributed to the Convention

by Mr. M. F. Francisco, who happens to be the Chairman of an Electric Lighting Company. Mr. Francisco's paper was a most damaging exposure of results of municipal management of this service, from which it appeared that "maintenance" was the rock upon which most of these undertakings split. The local authorities in the United States were earlier in the field of electric lighting than British municipalities; and in many instances they have had enough of it—selling out their franchises and plants to companies at a loss, rather than keeping the undertakings going out of the rates.

PERSONAL.

Mr. W. M'Kay has succeeded the late Mr. G. B. Clarke in the secretaryship of the Woburn Gas Company.

Mr. Hanbury Thomas, the General Manager of the Sheffield United Gas Company, has been appointed Secretary, in succession to the late Mr. W. Wake; and he will now hold the two offices.

The Brighton Town Council, on the recommendation of the Water Committee, have resolved to increase the salary of Mr. J. Johnston, Assoc.M.Inst.C.E., the Water Engineer, by £100 per annum.

Mr. W. Severs, of Lymm, has been appointed, out of 35 applicants, Engineer and Manager of the Wilmslow and Alderley Edge Gas-Works; and Mr. R. Surtees, Assistant-Manager at the Stoke-upon-Trent Gas-Works, has been chosen, out of 73 candidates, to succeed him.

Mr. W. O. Roper, who has faithfully served the Lancaster Corporation as Town Clerk during the past eighteen years, is relinquishing his position in consequence of ill-health. During his official career, the most cordial relations have existed between him and the whole of the corporate staff; and the heads of the various departments have shown their esteem and regard for their retiring colleague by presenting him with a beautiful silver candelabrum. The pleasing duty of handing the gift to Mr. Roper, on behalf of the subscribers, fell to Mr. C. Armitage, the Gas Engineer, and senior official of the Corporation.

Examination of Water.—Herr Nordlinger, in order to detect the possible entrance of cesspool liquids into wells, makes use of saprol. Cresoliferous disinfectants can be detected by smell at the dilution of 1 : 1,000,000, and by the characteristic taste if diluted to 1 : 2,000,000.

M. Berthelot on Modern Chemistry.—In opening the second International Congress of Applied Chemistry in Paris on the 27th ult., M. Berthelot, the Honorary President, dwelt forcibly on the indissoluble bonds uniting theory and practice in chemical science; and he remarked that the domain of chemical industries, properly so called, is daily enlarging, owing to the unceasing development of the methods of chemical synthesis. Referring to the astonishing results of the alliance between chemistry and physics, he discussed the whole problem of light; alluding, in the course of his remarks, to acetylene gas, which he said was even thirty years ago one of the "coryphæi" of chemical synthesis, when it was formed by the direct union of carbon and hydrogen in the electric arc. Some highly suggestive observations were made by M. Berthelot in the portion of his address in which he insisted upon the difference between the modern era of applied science during the last three-quarters of a century, and the whole development of the race during the past 6000 years. So marked is this difference, he said, that a new man is being created in a new earth; and the entire social organization is being transformed amid conditions for the comprehension of which the past offered no suggestive precedents or data.

The Parliamentary Inquiry on Petroleum.—Early in the session a Committee of the House of Commons was appointed to "inquire into and report upon the sufficiency of the law relating to the keeping, selling, using, and conveying of petroleum and other inflammable liquids, and the precautions to be adopted for the prevention of accidents with petroleum lamps." Mr. Mundella was the Chairman; and the Committee were engaged from March 24 to the 22nd ult. They then reported that they had not been able to conclude their investigation; but they recommended the appointment of a similar Committee early next session. Some very important evidence was adduced, to which more extended reference will be made when it is printed. In the meantime, it may be of interest to record some facts laid before the Committee by Mr. H. Mainwaring, a member of the Corporation of Manchester, in regard to accidents from petroleum lamps as compared with those arising from gas in that city. In the two years ending March, 1896, 89 lamp accidents occurred in the four police divisions of the city—11 being fatal. In at least four of the latter cases the accidents were owing to defective construction of the lamps. The accidents from gas in the city during the same two years were 13 in number; eight of them being damage to meters, arising from carelessness on the part of workmen in fitting the service-pipe. In 1895, there were in the city 102,000 houses, of which 66,345 were supplied with gas. In 1896, the number of houses was 103,000; and those supplied with gas were 73,500. Thus the proportion using gas had risen from 65 to 71 per cent.

TECHNICAL RECORD.

NORTH OF IRELAND ASSOCIATION OF GAS MANAGERS.

Annual Meeting at Holywood.

The Annual Meeting of the above-named Association was held in the Town Hall, Holywood, on Tuesday last, under the presidency of Mr. T. Frizelle, the Manager of the local gas-works. Holywood being close to Belfast, a large number of those who attended the meeting made that city their head-quarters on Monday night.

On Tuesday morning, the members visited the gas-works at Holywood, where they were received by Mr. Frizelle. The works were found to be in the very best of order, and to be capable of producing more gas than is required of them. A special feature was the repaired gasholder columns, which were snapped at the base by the great gale in December, 1894. To those who make a study of gasholder guide-framing problems, it may be of interest to state that this particular holder was surrounded by eight columns, of which six were snapped, and that the two which remained intact were those on the windward side. The President explained, in his Inaugural Address, his method of repairing them. On leaving the works, the members assembled in the Town Hall, where Mr. Frizelle took the chair at half-past eleven. There was a fair number present.

The Report and Accounts.

The Hon. Secretary (Mr. J. Whimster, of Armagh) read the report of the Committee. They expressed their pleasure at the flourishing condition of the Association, and at the success of the previous meeting in Drogheda. They announced with satisfaction that they had again secured the services of Professor Macadam, of Edinburgh, for a lecture, which, with the other items on the programme, they hoped would prove useful. The additions to the membership at last year's meeting brought up the numbers to 46 ordinary, 18 extraordinary, and 2 honorary members—a total of 66. The accounts certified by the Auditor (Mr. Edward Stears, of Lisburn) showed a balance in hand of £33 os. 9d.

On the motion of Mr. P. J. Salmon (Galway), seconded by Mr. M. Martin (Drogheda), the report was adopted.

New Members.

The following new members were admitted :—

Ordinary Members.—Henderson, A., Gas-Works, Warrenpoint; M'Lean, M., Gas-Works, Aughnacloy; Whimster, T., Gas-Works, Omagh; Woods, J., Gas-Works, Ballybay.

Extraordinary Members.—Kirk, R., Belfast; King, —, Belfast; Wood, W., Glasgow.

Resolution to Award Medals.

The President said that a matter had been brought before the Committee on the previous night, in regard to the success of their meetings and the reading of papers. The subject was debated very fully; and it was decided unanimously (on the motion of the President, seconded by Mr. Martin) to recommend to the general meeting that in future a gold medal should be presented to the writer of the best paper which might be read at the annual meeting—the decision to be made by the Committee, and the medal to be presented at the meeting in the following year. It was thought that such a policy would give an impetus to the members in the reading of papers. It was rather difficult for the Secretary to secure papers for the meetings; and the Committee thought that, having some funds in hand, they could not spend them in a better way than in giving a medal, as proposed. They were obliged to bring the matter before the general meeting; and any member who had anything to say in regard to the proposal, was at liberty to do so.

The Hon. Secretary said that, when the President made the proposal at the Committee meeting, it approved itself to his judgment at once. As Secretary, he knew the difficulty there was in inducing members to come forward with communications; and he thought it might not be a bad thing to give some little inducement, especially to younger members, to read papers. He did not want to put it as a pecuniary inducement; but a young man might say that there were a number of older men at the meetings, who might make light of any paper which he might read—that if they did not laugh outright, they might do so in their sleeve. Therefore younger members might be shy and diffident, and not care about coming forward with papers; but if they knew that the quality of the communication was to be looked at and judged by the Committee, and that they had a chance of being awarded a medal, they might—not for the intrinsic value of the medal, but for the honour—try to get up papers, and that, too, such as they would not otherwise give them. The annual meetings would be helped in this way. He therefore had very much sympathy with the proposal; and trusted that the meeting would adopt it heartily. They had funds, and could afford a medal perfectly well; and if it would stimulate the interest of members in the meetings, and the interest of the meetings to the members, he thought the money would be well spent.

Mr. A. Gibb (Newry) concurred in the observations which had been made. He thought it was a step in the right direction;

but could they not also, at the same time, hold out a silver medal for the second best paper ?

Mr. D. WILLIAMSON (Clones) supported this proposal.

The HON. SECRETARY said the Committee thought they had better try one medal to begin with.

Mr. P. J. SALMON (Galway) did not object to the second medal, but considered it advisable to have some funds in hand. He thought they might try one medal for a time.

Mr. A. MACKENZIE (Edinburgh), while he favoured Mr. Gibb's suggestion, thought it might be left to the Committee.

Mr. G. NORMAN (Dublin) suggested that there might be a silver medal for the readers of first papers, and that the gold medal might be open to all the members.

The PRESIDENT said he had just received a note which contained a proposal by their old friend Professor Macadam, to the effect that, if four papers were sent in, he would give a silver medal.

Professor MACADAM (Edinburgh) said that in the President's statement there was a violation of a condition he attached to the offer, which was that his name was not to be disclosed.

The PRESIDENT said he was sorry; but he had not had time to read the whole of Professor Macadam's note.

It was then agreed that the two medals be offered.

Mr. WILLIAMSON was sure it would be unnecessary to return the thanks of the meeting to Professor Macadam for his offer.

ELECTION OF OFFICE-BEARERS.

The following were, on the motion of Mr. GIBB, seconded by Mr. STEARS, elected office-bearers for the year:—

President.—Mr. M. Martin, Drogheda.
Vice-President.—Mr. J. Nisbett, Portadown.
Members of Committee.—Messrs. P. J. Salmon, Galway; W. A. Reid, Longford; and R. Ross, Dungannon.

Mr. NISBETT moved that Mr. Whimster be re-elected Hon. Secretary and Treasurer.

Mr. MACKENZIE seconded the motion; and it was carried.

Mr. WHIMSTER thanked the members for the confidence they were reposing in him. He wished to say that next year would complete his ten years of service as Secretary; and he really thought they should be looking forward to making a change in the office. His services were heartily at their disposal, so far as they went, and so far as they could be made to go; but he thought sometimes that new blood would do no harm. He would accept the office for this year; but he hoped that by the next meeting they would consider whether they could not lay violent hands on somebody else and put him into the office.

The PRESIDENT proposed, and the SECRETARY seconded, that Mr. E. Stears be re-appointed Auditor, which was agreed to.

ADDRESS BY THE PRESIDENT.

The PRESIDENT delivered the following

INAUGURAL ADDRESS.

Gentlemen,—My first duty, in rising to address you, is to thank you for the honour you conferred upon me by electing me President of the Association. Believe me, I esteem it very highly. My second duty is to welcome you all to Holywood.

It has, for some time past, been usual for Presidents of Provincial Associations to apologize for the want of some interesting subject upon which to speak; and seeing that gas literature is within the reach of almost every manager, and that the latest address, and also the latest invention or experiment, is published almost on the following morning, there is certainly a little difficulty in avoiding the old well-trodden paths. But in what profession or business is there to be found such variety of subjects, or such scope for experiment and investigation, as in that connected with the supply of gas? True, some of us have, at certain seasons, little time for experimenting. Yet I believe that, even in the smallest works, opportunity occasionally offers for the manager to try his hand in some of the many branches of his business which run outside the old-fashioned routine. I am of opinion that we in Ireland, taken as a whole, are in some things behind our neighbours in the sister countries. One reason for this is that not many of the towns supplied by gas have increased in size or population. In fact, with the exception of a few, they have decreased; and little encouragement is held out to managers, by owners of gas-works, to make alterations, unless they can prove that the change will add to the revenue.

I will give a few particulars of the way in which we do some things at Holywood. In the first place, being situated about four miles from Belfast on the shore of the lough, Holywood may be considered a suburb, with a population of a little over 4000. The majority of the inhabitants are Belfast business people who frequently change their residences. Before gas is supplied to them, they are requested to sign a stamped agreement form; and we also have it signed by another consumer as surety. This agreement unfortunately checks the consumption of gas, as some strangers object to signing it. But it also checks bad debts; and my Directors were obliged to resort to it, owing to the trouble we had in collecting accounts from former consumers who had left the district. Meter-rents are charged; and the consumer is allowed to choose either a wet or a dry meter. Prepayment meters are supplied for those who wish them; and they partly meet difficulty arising in connection with the agreement form. Gas-cookers are hired out, or sold at cost price. The Company are the sole agents in the district for incandescent gas-burners. Some may say this is questionable policy, owing to these burners giving increased light with a reduced consumption of gas. But in several cases we have, by their introduction, retained customers who purposed using oil, and have gained others who previously burned it. Attention is promptly paid to all complaints; and every consumer is treated with courtesy.

In the works, some of the retorts are heated on the direct-firing principle, and others by a modified form of regenerative setting. As the works are built on slob land, we are precluded for the present from taking advantage of the ordinary regenerative system of heating, by reason of water rising at times in the retort-house, and high tides overflowing the sea-wall in stormy weather. However, we expect to overcome these difficulties in time. The coals are weighed and placed in the retort-house by a barrow man. The index of the station meter is taken, and the figures marked on a slate in the retort-house as the stokers change; and as each man gets the same quantity of coals to carbonize, any deficiency in the amount of gas made is noticed at once. This system also creates a healthy rivalry, and good heats are maintained.

For motive power, we use a Crossley "Otto" gas-engine of the new type, which drives the exhauster, pumps the tar and liquor, turns the washer, and works an agitator when we are making sulphate of ammonia. It runs well, gives no trouble, requires little attention, and is most suitable for small works.

As our mains extend three miles in the direction of Bangor and one mile towards Belfast, consumers are in some places far apart. We test the mains at least once a year to check leakage. I explained fully the way in which this is done in a paper I had the pleasure of reading before you at the meeting held in Dundalk in 1889.*

I have no doubt some of you have cause to remember the storm which occurred on the night of the 21st of December, 1894. We felt the full force of it at Holywood. Besides stripping off our roofs, it broke six of the eight columns which guide our telescopic holder. It also made a break in the sea-wall; and the tide washed away some lamp-posts, and filled a 9-inch main leading from the works. The sea also flowed into the works and extinguished our furnaces; but with a good stock of gas in the holders, and a little extra exertion, all was in working order by lighting-time on the following night.

I repaired the guide-columns (all of which were broken at the bottom) by filling the inside up to a height of 2 feet with portland cement, to keep the pieces in place, and then put round the outside a concrete block 6 feet by 6 feet, and about 3 feet deep. The columns are bound to the centre of this block by a strap of 3-inch by 1¼-inch iron; and the concrete is bound to the foundation-stones by 2-inch square iron, turned at right angles in the form of a holdfast. All the iron is in the centre of the block. The holder has stood some severe gales since the accident; but there is no appearance of a shake.

I presume it is the ambition of every manager to sell his gas as cheap as possible, having a due regard to the interest of the shareholders; but in some instances this is done at the expense of the works. That is to say, necessary extensions or alterations to plant are put off for want of funds; or, as often happens when gas-works belong to the town commissioners, the surplus profit is taken for other purposes than either extending the plant or reducing the price. In a case of this kind, is it right that the consumer of gas should be made pay up, so that the non-consumer may be relieved? The first duty of every company or corporation who are owners of gas-works should be to keep the plant in thorough order, and then sell the gas at as low a price as possible, everything being considered; so that gas may continue to be the popular light of all classes. The lower the price is, the greater the consumption will be, if you have the population to work upon; and, as a rule, the greater the consumption is, the cheaper can gas be made.

In making alterations or extensions of plant in connection with gas-works, it is right, if at all possible, to have them in excess of the present requirements. That is to say, get your purifiers and connections, your holders and distributing mains, station meter and exhauster, large enough to leave a fair margin for increased consumption. Extra outlay incurred in this direction, when extensions are being made, is money well spent; and it will repay itself in several ways. In Ireland, where the illuminating power of gas seldom exceeds 20 candles, and is frequently sent out of from 16 to 18 candle power, the mains and service-pipes require to be larger than in towns where the consumers are accustomed to get 28 or 30 candle gas, as they are in some parts of Scotland.

The question of oil *versus* cannel for enriching purposes has been debated so fully at almost every Association meeting for some years past, and so many able articles have been published thereon, that I do not intend to do more than touch upon the subject. So far as I know, Scotland's favourite—the Peebles process, as it is called—has not been introduced into any works in Ireland, though some gas companies are at present considering the matter. But with the low illuminating power of the gas supplied, and the majority of the works carbonizing less than 1800 tons of coal per annum, a small quantity of cannel during the winter months is sufficient to keep up the standard;

* See "JOURNAL," Vol. LIV., p. 358.

in fact, some companies do not use any cannel, but depend entirely upon Scotch caking coal, which yields gas of fair illuminating power. If, however, we take a small works, making 10 million cubic feet of gas per annum, with a maximum daily make of 50,000 cubic feet, and wish to enrich this amount from 16 up to 20 candle power, we should require, in order to do this by oil gas, 5½ per cent., or a total make of 2750 cubic feet per day. Now, one ordinary sized oil-gas retort will make from 8000 to 9000 cubic feet of gas per day; and as the oil yields 22,000 cubic feet of gas per ton, it would take about 24½ tons of oil, at (say) 60s. per ton, or £73 10s. A complete oil-gas plant of suitable size, including royalty, would cost £250. If interest on capital, and depreciation, are taken into consideration, you can form an idea as to the cost of raising 16-candle gas by 4 candles. The patentees consider that 4s. per 1000 cubic feet of oil gas will cover all charges—viz., oil, fuel, labour, and depreciation. But considering the great and continual increase in the number of consumers who are adopting the incandescent burner for both public and private lighting, I question if it would be advantageous to raise the illuminating power of the gas in this country much above 18 or 19 candles.

When reading over the proceedings and papers presented at a gas managers' meeting, I remember that the incandescent burner came in for some rather doubtful compliments; but I consider it ranks among the greatest discoveries of the gas age. Look at the position in which the gas world was some years ago, with cheap petroleum for the poor consumer and electricity for the rich one. With the incandescent burner, gas companies can hold their own against either or both of these illuminants; and it has been the means of setting back the electric light an indefinite period. The doctrine of the survival of the fittest is as applicable to illuminants as it is to anything else; and I have no doubt that you will see the electric light supplanted by gas in all the lighthouses around the British coast, as it has been proved to demonstration that the former is of little or no use in thick or foggy weather. Had the lighthouse on Ushant been fitted with Wigham's powerful gas-burner instead of electricity, in all probability the *Drummond Castle* would have gone safely into port. Another fact is this—that in almost every town where electricity has been introduced for illuminating purposes, the consumption of gas has steadily increased.

Healthy rivalry is good for both manufacturer and consumer. It sharpens the energies, and is certainly the means of bringing out many useful inventions which otherwise would never have been produced. There is an old and true saying that "Necessity is the mother of invention." Carburetted water gas was brought to a high state of perfection in America through the difficulty in obtaining suitable coal. The Peebles oil-gas system was invented at a time when cannel coal was so high in price that few gas companies could afford to purchase it. The labour trouble caused the introduction of stoking machinery, sloping retorts, and other labour-saving appliances, all tending to progress and improvement upon the old system of working; so that time and talent are the means of revealing the "silver lining" of the cloud. If a difficulty is faced in an intelligent, determined spirit, it is bound to be overcome.

Another field for gas consumption has been opened up by its adoption as the motive power for tramcars. In several towns on the Continent, gas-driven cars have for some years been running with the greatest success, and at a much cheaper rate per mile than by any other method. The "Journal of Gas Lighting," in the months of January and August last year, published two valuable communications on the gas tramway at Dessau, by Herr W. von Oechelhaeuser, giving an interesting description of the gas-driven tramcars running there; and now we have them successfully introduced at Blackpool. By this method of propulsion, the vexed question of overhead *versus* underground conductors for electric cars is quietly settled; and we may expect that in a short time by far the greater number of cars will be propelled in this way. When we consider that each car will, according to size and traffic, require from 800,000 to 1,000,000 cubic feet of gas per annum, we shall get an idea of the extensive new field opened up for the gas industry; and it may not be confined to large cities, seeing that mechanical motor cars are coming to the front to take the place of the horse. The time may, therefore, not be far distant when every gas-works will have a compressing-engine for supplying the public with compressed gas.

I am old enough to remember the time when gas companies ruled the lighting world—when rivals were mere pigmies. For years little or no progress took place; and what a spirit of secrecy and jealousy prevailed among managers! Fortunately, that time is gone, never to return. Nothing has tended more to dispel the exclusiveness I have referred to than gatherings such as these, where managers are sure to meet at least once a year, and the experience of older members is brought to bear upon any subject brought forward for discussion. And I might here take the opportunity of pressing upon the attention of all the necessity for each member to do his part by contributing a paper for discussion when requested. It will, believe me, lift a load from the mind of our Honorary Secretary, who, I think you will agree with me, is a model one, and whose duties at times are not to be coveted. I might also, in conclusion, say a word for those members who submit papers for discussion. I think it would be well if a little more encouragement were given to the various contributors, especially if the writers are young members.

Mr. Salmon proposed a vote of thanks to the President for his address. There could be no doubt, he said, that he had given the subjects he had treated considerable study, and had got away from the beaten tracks to a great extent.

Mr. Nisbett seconded the motion; and it was agreed to.

The President briefly returned thanks.

Reading of Papers.

The following papers were then read: "Difficulties I have Met with, and How they have been Overcome," by Mr. W. Miller, of Cookstown; and "Notes on Gas-Burners," by Mr. A. Gibb, of Newry. The latter appears elsewhere; and Mr. Miller's paper, with a report of the discussions, and of a conversation on the subject of "Loss by Leakage, or Unaccounted-for Gas," initiated by Mr. Salmon, will be given next week.

The Luncheon.

The meeting then adjourned for luncheon, which was provided by the Directors of the Holywood Gas Company. Dr. D. Johnston, one of the Directors, occupied the chair. He welcomed the Association to Holywood, and expressed the hope that it would not be the last visit they would pay to the place. He proposed the toast of "Success to the Association." Mr. Whimster acknowledged it; and in turn proposed "Prosperity to the Holywood Gas Company." This was responded to by Mr. J. H. Barrett, the Secretary of the Company. Mr. Barrett's attention to the comfort of the members during the day is worthy of mention, as having added greatly to the pleasantness of the gathering.

Place of Next Meeting.

The President (on reassembling) said they had not yet decided where they were to meet next year.

Mr. W. Nisbett (Monaghan) proposed that they should meet at Omagh.

The Secretary said that, if he might be allowed to make a suggestion, he would propose that the meeting be held in Newry. Omagh, he thought, would be rather difficult to get at by most people.

The President remarked that, the present meeting having been held so far north, it was thought Newry might be more convenient for the southern members.

After a short conversation, however, it was unanimously agreed to meet next year at Omagh.

The Lecture.

Professor W. Ivison Macadam, of Edinburgh, then delivered a lecture, illustrated by experiments, on the subject of "The Chemistry of Ammoniacal Liquor." This will be found on another page.

The President, at the close of the business on the programme, said he thought the members had fully enjoyed their meeting. They in Holywood were very pleased to see them all there; and they were all exceedingly obliged to Professor Macadam for coming across to lecture to them.

Vote of Thanks to the President.

Mr. W. Stormonth (Coleraine) said it was his privilege to propose a very hearty vote of thanks to the President for his conduct in the chair. It had afforded him very great pleasure to be at Holywood; and he believed he was speaking for the rest of the members when he said that the meeting had been a most enjoyable and most successful one in every way. He thought this success had been greatly brought about by the President.

Mr. Salmon seconded the proposition.

The President, in returning thanks, said it had been a great pleasure to him to meet the members at Holywood. He had always found, in going round the North of Ireland, and also in Scotland, that he was met with the greatest pleasantness and friendship by every manager. This was right; and it was also the spirit in which their Association should exist—they ought always to be ready to impart information to each other. He thought the Association had hitherto performed its mission in this respect.

The members were afterwards entertained by the Committee to tea. Hitherto the Association has been in the habit of having an excursion on the second day; but this year it was felt that while, on the one hand, there were no places within easy reach of Belfast that were sufficiently popular to make an excursion to any of them a success, on the other most probably the town of Belfast itself would be the greatest attraction to members from a distance. No arrangements were therefore made for an excursion. After the meeting, however, a number of the members resolved to organize a run to some popular place. The Giant's Causeway was selected; and on Wednesday a considerable party visited this wonder of Nature. They were favoured with good weather; and though "pot luck" was the order of the day, they fared well, and separated with the feeling that the Holywood meeting had been one of the best the Association had ever held.

THE CHEMISTRY OF AMMONIACAL LIQUOR.

By W. Ivison Macadam, F.R.S.E., &c.

[A Lecture delivered at the Annual Meeting of the North of Ireland Association of Gas Managers.]

The manufacture of ammoniacal liquor, or gas liquor, although not the primary substance for which gas-works are erected, is yet a substance which may not be neglected. The mode of manufacture is well known to you, and so it need not be explained in detail.

The coal used in the works contains a proportion of nitrogen which varies greatly in different coals, as may be seen from the following table :—

Nitrogen in Coals.

	Per Cent.
Wales	0·91
Lancashire	1·25
Newcastle	1·32
Scotland	1·44

Coal as retorted in gas-works gives generally from 6 to 10 per cent. of ammoniacal liquor—an amount which is very far short of the possible yield; for if we calculate the figures given above into ammonia, we get—

	Nitrogen. Per Cent.		Ammonia. Per Cent.
Wales	0·91	..	1·10
Lancashire	1·25	..	1·52
Newcastle	1·32	..	1·60
Scotland	1·44	..	1·75

And if we further calculate these last figures into ammoniacal liquor at 4° Twaddell, we find that—

Coal from Wales should yield 142 gallons of liquor.
" Lancashire " 196 " "
" Newcastle " 206 " "
" Scotland " 226 " "

As you all know well, the actual yield rarely exceeds 45 gallons, and is often not more than 25 gallons, and may even run as low as from 10 to 15 gallons. What, then, is the cause of this low yield? In answering this question, we must always keep in mind that we are not primarily manufacturers of ammonia, but that this body is simply a bye-product.

In shale-works, where tar is the primary object, it is possible to convert the works not only into a tar-works, but also into an ammonia manufactory. Beilby, studying the subject with this intent, has succeeded in his purpose to a great extent. In the older days, the paraffin oil works had to be content with a yield of from 10 to 12 lbs. of sulphate of ammonia per ton of shale. In these days, the retorts were very similar to those still used in gas-works, and were set in a similar way. From an oil point of view, this class of retorts was the very worst possible, as the oil tar when liberated was subjected to a prolonged action of heat radiated from the sides and top of the retort—an action which led to much splitting up, and the production of large quantities of gas and less tar. The first change was to upright retorts heated only at the lower part; and later an exhaust was used to remove the tar as rapidly as possible from the heat. As, however, the exhaust was found not to act readily without the introduction of air, such introduction was attempted, with the result that the heat of the retorts rose very high—much too high for good oil results. Steam was then tried instead of air, with the best effects. Not only, however, was the oil product largely augmented, but the quantity of ammoniacal liquor was, of course, considerably increased, and the content of ammonia was also much greater.

Working in this way, Beilby, using a coal the nitrogen of which was equal to 165 lbs. to 170 lbs. of sulphate of ammonia per ton, obtained from 95 lbs. to 125 lbs. per ton of coal. From the paraffin retorts, the yield of which previously was from 10 lbs. to 12 lbs. of sulphate per ton, the yield now is rarely below 25 lbs. to 36 lbs. This increase may, to some extent, be explained by the action of the steam upon cyanates, which would otherwise be formed in considerable amount. I need not say that this process could not be advantageously adopted in the ordinary gas-works; yet it is interesting to you, as showing to some extent the method of the formation of the ammonia found in the gas liquor.

Gas liquor is a somewhat complex mixture, containing a large number of compounds of ammonia, of which the principal are free ammonia, carbonate of ammonia, sulphide of ammonia, sulphocyanate of ammonia, chloride, sulphate, and thiosulphate (hyposulphite) of ammonia. Of these compounds, the ammonia and carbonate and sulphide of ammonia are spoken of as "free" ammonia, and the others as "fixed." As generally the latter class is only present to an extent not greater than 0·3 per cent., it is usually ignored in the valuation of the liquor.

In Scotland, the gas manager is not, as a rule, called upon to work up the ammoniacal liquor into sulphate of ammonia; but in England and Ireland, the material has frequently to be so treated. In every case, I may fairly say that fixed ammonia is not worth considering, and will not pay for the cost of the material required to remove it from the liquor.

The free ammonia is, as we have already seen, not only that portion of the ammonia which is uncombined, but also that part which is combined with sulphur as sulphide and with carbonic acid as carbonate. These two compounds, when heated, even in solution, are decomposed into ammonia and carbonic anhydride, or ammonia and sulphuretted hydrogen; and if the gases are then passed into an acid stronger than the sulphuretted hydrogen or carbonic anhydride, the ammonia will combine with the stronger acid, and allow the weaker carbonic anhydride and sulphuretted hydrogen to remain uncombined.

In treating the ammoniacal liquor, it is found best to employ direct open steam, as will be shown by the following experiments:—

Open fire for	22 hours	gave 90	p. ct. ammonia present.
Steam coil for	18 "	" 92	" "
Direct open steam for	14 "	" 98½	" "

I rather doubt whether it is possible for a gas manager to work up his ammoniacal liquor at a profit; for, to do so successfully, it is necessary to have plant of a costly character. The older direct saturators do not give satisfactory results; and the newer methods cause great outlay for plant. Further, the vitriol which has to be supplied to saturate or fix the ammonia has generally to be carried for some considerable distance to the gas-works; while in most cases the larger buyers of ammoniacal liquor conduct other processes necessitating the use of vitriol, and from which an impure acid may be recovered sufficiently good for sulphate manufacture. It therefore follows that the large buyers can afford, or should be able to afford, to give a price for the crude substance which should be better financially than the return if the gas manager is compelled to work up the material at his works.

The lecture was illustrated throughout with experiments. At its close,

The President (Mr. T. Frizelle) said that on more than one occasion their friend Professor Macadam had come across the Channel and given them an able lecture; and he thought that the present one exceeded anything they had yet received from him. It was a practical subject for gas managers. Last year, at Drogheda, they were very much interested in his remarks upon flame; but this year's lecture came much nearer to each of them, in regard to the obtaining of as much nitrogen as they possibly could from coal. He thought the best thanks of the Association were due to Professor Macadam.

The Hon. Secretary (Mr. James Whimster) said they had arranged that Professor Macadam's lecture should come last in the proceedings—he presumed from the selfish point of view, that the lecture would be the *pièce de résistance* on the programme, and that everybody would wait for it. He was sorry to see that so many had absented themselves—he could not say for what reason; but he thought the lecture had been, if anything, the most interesting part of the whole meeting. He considered they owed Professor Macadam their best thanks for his lecture. It had really been a most practical one, bearing intimately on their work, when he told them how much nitrogen there was in coal, and how little they got out of it. He (Mr. Whimster) wished Professor Macadam had gone on for another hour giving them such information as he had done.

Mr. P. J. Salmon (Galway) remarked that, as he had come from the extreme west of Ireland, he must say it amply paid him to be present at a lecture by Professor Macadam.

Mr. W. Stormonth (Coleraine) asked to be allowed to supplement the remarks which had been made, by personally thanking Professor Macadam for his lecture, and expressing the hope that he might continue it on some future occasion. It was hardly fair to criticize a lecture, but perhaps the Professor would pardon him for saying a few words upon it. With regard to the use of lime to fix ammonia, when he went home he should try the experiment, to see if he was right; and, if not, he would let him know. With regard to its not paying in small works to make sulphate of ammonia, Professor Macadam was right, and not right. His remarks were correct when applied to gas-works in the immediate vicinity of chemical manufactories, but not when they were situated at a distance from them.

The Hon. Secretary said he never used lime to fix ammonia, because he understood that unless the fixed ammonia amounted to a certain percentage, the lime would be rather a nuisance than otherwise. There would be difficulty in getting rid of the waste products. They could not run them away like waste liquor. Altogether, he thought it was more expensive to use lime than to let the fixed ammonia go, unless it rose considerably above a certain percentage.

Professor Macadam thought he had admitted, in his remarks, that there might be advantages in making sulphate of ammonia if they were far away from a manufacturer of chemicals. If he did not make himself sufficiently clear on this point, he did so now.

NOTES ON GAS BURNERS.

By A. Gibb, of Newry.

[A Paper read at the Annual Meeting of the North of Ireland Association of Gas Managers.]

At the solicitation of our Hon. Secretary, and to fill up a few minutes, these homely notes are presented here, and are for the purpose of provoking a good conversation at this meeting.

In the early days of gas lighting, no definite mode of constructing burners was adopted. Every maker followed his own

idea—in fact, the principles and perfection of flame were unknown to them. As a consequence of this, immense loss of money, and great dissatisfaction, prevailed among gas consumers; and if the present consumers growl and grumble with the existing improved burners, we can sympathize with our forerunners in their distress.

Prior to the year 1866, little or no attention was given to the proper construction of gas-burners; but since then, there have been vast improvements introduced, so that every other part being attended to, there should be peace at home. The conservatism of some, and suspicion of others, towards advice from gas managers—blaming them with advancing their own interest; and judging their burners to be more extravagant—has caused many consumers to rush into the arms of the itinerating burner sellers, who perambulate the country, and live on the idle conceits of the careless consumers of gas. This feeling has caused language not parliamentary to be hurled at the gas manager; and as you all can testify, there has been no retaliation on our part. We have, "when smitten on the one cheek, turned the other also," and thus produced a better and more kindly feeling among consumers in a great many cases, which it is desired should exist everywhere.

Mr. Sugg, of London, in 1869, in a paper read before the British Association of Gas Managers, gave results of sundry gas-burner experiments. I cannot do better than give you his results, as illustrative of the loss accruing from using inferior and badly-constructed burners.

The gas used, tested photometrically by the Letheby standard burner, was equal to 14 candles:—

In argands of different makes and patterns, there was a loss of	12·86 to 79·82 per cent.
In batswing burners with steatite tip, a loss of	7·14 "
" " " iron " " "	60·16 "
With fishtail " " " " "	33·14 to 60·97 "
Amsterdam steatite, with wool in cone " "	1·10 "
A steatite burner, compared with an iron burner, varied in value, as regards loss, in favour of the former, from	7·5 to 64·00
"London" argand compared with other makers, varied from	0·0 to 73·50 "

From these examples, you will see how important a part good burners play in the development of flame.

Every common flame consists of three parts—the inner layer of unchanged gas, the cone of luminous matter, and the outer shell or covering of complete combustion. The luminosity of flame depends on the amount of solid particles it contains—the richer it is in those particles, the brighter the light; and the fewer of these particles there are, the poorer the light. In the flames of hydrogen, sulphur, and carbonic acid there are no solid particles, and hence they are not light givers; but in gas, the particles of carbon are very numerous. "It therefore follows that every circumstance which increases the number of solid particles, within a reasonable limit, or which exalts the temperature of it, increases the light of the flame, and prolongs the time of their ignition; and, conversely, everything which destroys the particles or lowers their temperature, will also destroy the light."

The proper supply of air to the flame is the point of importance. If too much air is supplied, the flame becomes oxidized, and the light is bad. Every burner has its own point of giving its maximum of light; and if this is either increased or decreased, a corresponding injury is developed. When the flame of any gas-burner is about to smoke, then is the time of full development or best light.

Temperature, again, improves or vitiates the luminosity of flame; and hence steatite, adamas, or lava, has been substituted for the iron tips which robbed the flame of some of its heat through abstraction and radiation, and took away from the value of the light. Violent chemical action takes place when a flame of gas is evoked; so that any material which withdraws heat should be removed. Hence steatite, in one form or another, is now used.

Over-pressure is injurious, because the rush of gas through the burner being increased, too much air is brought into contact with the flame, the solid particles are destroyed too quickly, and some pass off unconsumed; and therefore there is a great diminution of light. Some burners are constructed to obviate this; but the greater number are not. True, over-pressure is to a certain extent prevented in some of the common burners; but consumers are not always alive to this important fact.

The standard "London" argand burner, as improved by Mr. Sugg, is worthy of consideration. Every part of it has an object in view. The gas is led through three small supply-pipes into a larger chamber, and there to a certain extent comes to a state of repose, and so reaches the point of ignition in a quiescent condition; and hence we have such fine results in the development of flame that the Gas Referees have selected it as the standard of light. Anyone can, on the contrary, see the injurious effects of over-combustion by altering the air supply, either by lengthening or shortening the chimney, and obstructing the air supply, or preventing the products of combustion passing away freely.

A great improvement was also effected, I believe, by Mr. Sugg, in the mode of cutting the slit on the top of steatite burners. A plain cut was used at one time; but he introduced a circular saw cut, which improved the flame issuing therefrom, and as a consequence developed the light to advantage. Table-top burners were also introduced by him, with the object of deflecting upward currents striking the gas-flame.

The Bronner burner was a very early improved burner. Its body is a little longer than usual; and it has a steatite tip. The gas entrance is restricted to a small slit, so as to allow the gas to come slowly and evenly to the burning point. Double burners, with their tips set at certain angles, have never become very popular. Two rat-tail burners being brought to strike against each other improved the light, and led to the formation of fishtail and union-jet burners, now so common.

The various "Codacs" now advertised are certainly a great advance on the single burner. The light is improved; and no extra gas is used. It would suit to give them a trial. The latest "Codac" is that of Williams and Dean. The steatite top is perforated by a series of small holes; and from a circular now before me, the light is said to be increased: from an ordinary No. 1 union-jet burner, 233 per cent.; from a No. 2, 136 per cent.; and from a No. 3, 64 per cent.

Regenerative burners have found their way into the market. They are useful for lighting up large areas; and certainly they do their work satisfactorily. I am sure you have all seen the Siemens, Wenham, and other large lights in use, and marked their adaptability to the situations in which they were placed. To a certain extent, the inflowing gas to the burner is heated, and so leads to greater improvement in developing the value of the gas light.

A new London Company has revived the dormant Wenham Company, and made some improvements; and certainly the burner looks very well. In June last, I went to Bloomsbury Street, London, and had an opportunity of seeing it in operation. The light was remarkably bright, and spread all over the room; one burner in a medium-sized room doing this. I was told the consumption was only 4 cubic feet per hour. I also went to a shop in the Tottenham Court Road fitted up with these burners; and certainly every corner of the shop was beautifully illuminated. This same shop had been fitted up with the electric light; but the owner took out all the fittings and put up these new lamps, and he was more satisfied with the gas.

The incandescent gas-burners are now so common and so generally introduced, that I need not take up your time about them. Suffice it to say these burners have been a great rival to the electric light. Their superiority as lighthouse lights, for penetration in dark weather, over electricity, has been freely discussed since the unfortunate loss of the *Drummond Castle*.

I think I have now said enough to direct attention to this small matter. A burner is not large, yet it can be the cause of much contention and dissatisfaction. The gas now produced is good; being freed from all impurities, and of good illuminating power. Yet how few consumers give due attention to their burners; and if you say the gas is of such a quality, they will quietly shake their heads and say: "Do you expect us to believe that?" Such, at least, has been my experience. I wonder what yours has been?

THE ARROL-FOULIS STOKING-MACHINES AT EAST GREENWICH.

At the Monthly Meeting of the Gas Engineering Society held on the 12th inst., Mr. W. A. Barnett read a paper on the Arrol-Foulis hydraulic stoking-machines, giving special particulars of their working at the East Greenwich station of the South Metropolitan Gas Company. Mr. Barnett dealt first with the Galloway boilers and pumps used to generate the hydraulic power; and then passed to the arrangement of pressure-pipes in the retort-house. A 2½-inch pipe runs down each side of the house, 7 feet from the stage-floor, and is reduced half-way down to 2 inches, having only one set of machines to supply from this point. Tees with a 1-inch outlet are taken off the main at intervals of 30 feet—each one supplying a machine for 15 feet on either side. Special hose nozzle brackets are used, to facilitate quick connections. Mr. Barnett then described the flexible steel-wire armoured hose employed, and the method of connecting, which is done practically instantaneously. A great improvement in this, which considerably lengthens the life of the hose, has been the introduction of a back-pressure valve by Mr. J. Tysoe, the Engineer of the East Greenwich station. This is placed at the end of the hose remote from the machine, and so saves the repeated shock when the pressure is turned on, as well as preventing the hose emptying on the stage-floor, which was formerly a nuisance. A full and detailed description of both the charging and drawing machines followed; and the arrangement for returning the exhaust water to the supply-tank was also dealt with. Mr. Barnett then mentioned that the machines were propelled along the stage by a power-driven endless wire rope passing over pulley-wheels on the machines. The lives of the various working parts were considered; and then the question of cost was taken. On this point some most interesting figures were given. It appears that where, with the machines, 26 men are employed at a cost, including maintenance, fuel, and interest, of 11·5d. per ton of coal carbonized, with hand stoking 80 men are required, at a total cost of 25·9d. per ton—figures which go far to prove the success of the machines. The paper was illustrated with detailed diagrams of the machines. A discussion followed the reading of the paper.

BRITISH ASSOCIATION OF WATER-WORKS ENGINEERS.

Continuing our report of the proceedings at the recent annual meeting of the above-named Association, we give to-day an abstract of the paper read by Mr. PERCY GRIFFITH, Assoc.M.Inst.C.E., with the discussion thereon. He took for his subject the

HALSTEAD (ESSEX) WATER-WORKS EXTENSIONS.

These extensions were carried out under the author's late partner, Mr. Jabez Church, at Halstead, in 1890. Mr. Griffiths selected these works for description, not on account of any remarkable or unique characteristics, but as being a fair example of modern practice in the water supply of small towns. The population of the town at the time the work was undertaken was 8000. The original works not allowing of extensions or repair *in situ*, it was necessary to erect the new works independently of them; and a site at the lower part of the town was selected. The Local Government Board, in sanctioning the loan, stipulated that a trial boring should be made to test the yield of water before the work was commenced, which, unfortunately, considerably added to the cost. The boring, was made, and proved perfectly successful; the chalk water rising and standing only 6 feet below the surface. The boring was carried down to a depth of 250 feet. The well was then commenced; and in order to more effectually exclude the surface water, and also because it would have been both difficult and expensive to keep the water down sufficiently to allow of the well being lined with brickwork as proposed, cast-iron cylinders 8 ft. 6 in. internal diameter, in five segments, were forced down as far as the first bed of clay. At the first attempt, however, to pump the water out, it was found that this bed was utterly useless as a natural bottom to the well; and the cylinders were driven down to the lower bed. To do this after the interval which had elapsed was a difficult matter, as the soft sandy strata above the clay had firmly gripped the outer face of the cylinders; and many tons of old rails had to be piled up on to the top flange before any movement could be effected. Progress was consequently very slow, and, with such large quantities of water pouring into the well, extremely difficult and dangerous. Ultimately, however, the lower bed of clay was reached, and another attempt was made to pump out the water. This proved as unsuccessful as the first, as the clay was of a very loamy and unreliable nature, and was blown into the well in large quantities—in fact, to such an extent, that portions of the boiler-house which had been erected subsided, and had to be rebuilt.

After this experience, it was useless to think of executing the adit to the trial borehole as had been intended, and two alternatives only remained—viz., to construct a syphon from the trial boring into the well, or to sink a second boring from the bottom. The latter course was adopted. The next difficulty that presented itself was the forming of a water-tight bottom to the well, so that there should be no possibility of the chalk water being contaminated by the surface water. Concrete made with hydraulic cement was tried; and more than 15 feet of this was put in, and allowed to set, before any pumping was allowed. Even then, however, the pressure was so great that water still found its way through; and it was necessary to fit a cast-iron plate made in segments and caulked round the outside and along all its joints above the concrete before the well could be passed as sound. The second boring was then carried out on exactly similar lines to the first, and proved equally successful as regards yield of water.

The water-level being so near the surface, it was necessary to fix the pumps below this level, in order to command as much of the available water as possible; and as this would have made it impossible to repair the valves, unless provision was made for emptying the well when necessary, a large sluice-valve was fixed on the top of the guide-pipe, connected by rods and gear to a hand-wheel in the engine-room. By this means, it was a very simple matter to empty the well—at any rate, as low as the suction-pipe extended—whenever anything required to be done to the pumps. A practical note may be added here to the effect that it was found desirable to have this valve worked regularly every day to prevent it sticking. This was no doubt due to the gearing and rods as well as to the position of the valve.

The pumping machinery consists of duplicate boilers, high-pressure horizontal engine, and a set of three-throw bucket and plunger pumps. The boilers were of mild steel, 14 feet long by 5 ft. 6 in. diameter, shell plates $\frac{3}{8}$ inch thick, end plates $\frac{1}{2}$ inch thick, and all edges planed and rivet-holes drilled. The flues (containing two furnaces) were 2 ft. $1\frac{1}{2}$ in. diameter, and had nine "Galloway" cone tubes fitted in each, with side pockets or deflectors to direct the flames on to the tubes. The engine was of 14 nominal horse power, with cylinder 12 inches diameter by 24-inch stroke, steam-jacketted, and lagged with felt and mahogany strips. The governor was connected with the expansion-valve, so that variations in load were equalized by varying the cut-off, and not by diminishing the initial steam pressure. The fly-wheel was 9 ft. 6 in. diameter by 10 inches wide on face, and weighed over 4 tons. The speed normal to the engine was 70 revolutions per minute; and, the gearing being in the proportion of 19 to 26, the speed of the pump-shaft was about 20 revolutions per minute. The shaft was of steel, 6 inches diameter, having the three cranks forged out of the solid. Specially heavy plummer blocks, having large wearing surfaces, were designed to carry this shaft. The three connecting-rods were 10 feet long, and tapered from $4\frac{1}{2}$ in. by $2\frac{1}{2}$ in. by $1\frac{3}{4}$ in., and were connected at their lower ends to wrought-iron slipper guides working on wrought-iron guide-bars. The pump-rods were 2 inches diameter solid; but as the pumps were fixed only 17 feet below the floor-level, only one length was required to each pump. The pumps were each 9 inches diameter by 21-inch stroke, with three suction-valves and one delivery-valve of gun-metal. The buckets were also of gun-metal, packed with spring rings of the same metal. All the valves were fitted with steel springs to ensure a quick return on to their seats. The rams were of cast iron, and of a displacement area equal to one-half that of the buckets; and thus secured practically a constant delivery from the pumps throughout the stroke. The average velocity of the buckets when running at the normal speed of 20 revolutions was 70 feet per minute.

The rising-main was 9 inches diameter, with flanged joints up to the air-vessel, after which ordinary socket joints were used. The air-vessel was fixed just outside the engine-house; and was 2 ft. 9 in. diameter and 8 feet high, having the inlet and outlet branches cast on the base at right angles to one another. From this the rising-main was laid up to the new reservoir on the site of the old works—a distance of little more than a mile. A sluice-valve, relief-valve, and back-pressure or flap valve were fixed on this main between the well and the air-vessel.

To secure every economy possible, a feed-water heater was fixed to utilize the exhaust steam for this purpose; and the condensed steam was run back to the suction-feed tank, where a special device was adopted to prevent the grease and oil from being drawn up by the pump. The author here states why a condensing-engine was not employed: It increases the machinery to be looked after; and where works are as small as these, the one engine man usually employed has quite enough to look after. Then the extra cost is very large in proportion to the economy secured; and, again, the water being pumped direct to the service reservoir, and thus into the mains, the increase in temperature, though not great, would be objectionable.

The capacity of the whole plant is about 16,000 gallons per hour, or 160,000 gallons per day, pumping ten hours out of the twenty-four, which give twenty gallons per head per day on the then population. By extending the hours of pumping, the supply could be increased to a maximum of 384,000 gallons per day.

The old service reservoir was a cast-iron tank, holding 23,500 gallons; and it was decided to carry out a new reservoir of larger dimensions, and fixed at a higher level. The tank was of wrought iron, 27 feet diameter by 24 feet deep, and held about 85,000 gallons when full; and thus made the total storage about 108,500 gallons. The side plates varied from $\frac{7}{16}$ inch thick at the bottom to $\frac{1}{4}$ inch at the top, and were stiffened by a 5 in. by 3 in. by $\frac{3}{8}$ in. angle-iron curb at the top—two intermediate rings of 6 in. by 3 in. by $\frac{3}{8}$ in. tee-iron, and bottom curb of $4\frac{1}{2}$ in. by $4\frac{1}{2}$ in. by $\frac{1}{2}$ in. angle-iron. By the direction of the Local Government Board, four tie-rods were added to further strengthen the sides. These were fixed horizontally and radially from one of the tee-iron rings to the centre column supporting the roof, and were 1 inch in diameter. The floor-plates were $\frac{9}{16}$ inch thick, and rectangular in shape, and were covered on the inside with concrete about 3 inches thick, finished with a rendering of neat cement, and arranged to give a fall to the wash-out pipe.

The fittings in the tank consisted of a 9-inch overflow fixed at top-water level, into which was connected a 6-inch wash-out pipe just below the bottom of the tank, controlled by a 6-inch sluice-valve; a 9-inch rising-main springing from a duck's-foot bend at the base of the tower, and extending to a height of 20 feet above the floor of the tank, so as to give a constant head on the pumps; and a 9-inch service-main from the bottom of the tank controlled by a 9-inch sluice-valve. Connections were also provided between the rising-main and the old tank so that either could be filled from the pump.

Having described the construction of the tower, the author gives the cost of the works, as follows: Well, with two borings, £1607; engine and boiler house, chimney, boiler-settings, foundations for engines, &c., £1244; pumping machinery, £2190; brick tower, with wrought-iron tank, and all fittings, £2036; land, engineer's fees, and contingent expenses £930—total £8007. This works out at only £1 per head of the population in 1890; and if the trial boring had been dispensed with, the total would have been some £300 less, or only about 19s. 3d. per head. Calculating, however, upon the maximum population for which the works are sufficient—viz., about 16,000—the cost equals 10s. per head, which is a remarkably low figure, considering that it includes everything required for a completely new works, except the distributing-mains and services. As a matter of fact, it was found on working the new plant that the saving of coal alone more than covered the interest on the money borrowed and the sinking fund; and it may therefore be claimed that the new works cost the ratepayers practically nothing.

Discussion.

Mr. J. LEES (Tonbridge) inquired if the good results from the boring had been fully borne out. It was, he added, very satisfactory to be able to supply a town with only ten hours' pumping.

If Halstead was a water-closet town, 20 gallons was a very moderate supply.

Mr. W. MATTHEWS (Southampton) was glad Mr. Griffith had had the courage to bring before the members a case of failure. Referring to the difficulty experienced in getting the cylinders down, he described a remedy he had often found efficacious in the case of cylinders sticking. He tapped a hole in two or three places, coupled up a high-pressure service to them, and pumped water into the neck of the cylinder. The cylinders were by this means lubricated; and the sand was got almost into a state of flotation. He did not say this would always succeed; but in four cases out of five, the cylinders would move very readily. He protested strongly against the use of the term "nominal horse power." It might be ignorance, but he confessed that he did not understand it; and, in his opinion, it was time the word "nominal" was discontinued. As to the pumps, the author stated that the buckets were packed with spring rings. He (Mr. Matthews) had given up the use of rings altogether in buckets and pumps. Providing the water was not of a very sandy character, he had found it much better to use deep solid buckets or plungers. He had been using pumps with buckets 21 inches diameter, and from 18 inches to 21 inches deep, of solid cast iron. If they were well kept up, they would work for a long time, with a maximum slip of not more than 2 to 2½ per cent. Springs would no doubt continue all right for a long time; but if one happened to be running hard, and was pressed, and had not time for a systematic inspection, the springs would go on until they were worn thin, and it was only those who had experienced it who knew the trouble that arose with a spring that had got loose in a barrel. Mr. Griffith also told them that the valves were fitted with steel springs to ensure a quick return on to their seats. He (the speaker) would rather hesitate to put in these springs. They were told that the average velocity of the buckets, when running at the nominal speed of twenty revolutions, was 70 feet per minute. If the author had told them what was the velocity of the water through the buckets that would probably have given them more information. Alluding to the use of surface condensers, he emphasized the importance of great care being taken to prevent an accumulation of grease on the boilers. In connection with the wrought-iron tank, Mr. Griffith did not say whether he had to make any particular arrangements for expansion and contraction, and the consequent effect upon the rigid fittings in the tank.

Mr. F. STORR (Wrexham) asked what induced the Local Government Board to have the circular tank strengthened by tie-rods.

The PRESIDENT also alluded to the importance of excluding grease—mentioning a case within his knowledge where he used tallow on the cylinders. It was carried along to the boiler; and the water condensing a large amount of bi-carbonates of lime, the grease, along with the deposits of the water, formed a paste on the top of the furnace-tubes something like white lead. The crown came down; and the fusible plugs then began to operate. It had been a point with him whether these fusible plugs were worth putting in.

Mr. GRIFFITH, in reply to Mr. Lees, said he believed water-closets were used; but whether extensively, he could not say. He had some hesitation in advancing such a view; but with due inspection, and without too great a proportion of manufacturing use, a supply of 20 gallons per head was sufficient. While thanking Mr. Matthews for his "tip" as to getting cylinders down, he was a little doubtful whether it would have applied in this particular case, for this reason—that the surface soil was gravelly, and was already saturated with water. It was right on the banks of the river; and the gravel seemed to be full of water almost to the surface. He did not know whether the forcing of water in under pressure would have produced any beneficial effect; but there was a great deal of water round the cylinders, which should have lubricated them to some extent. [Mr. MATTHEWS: You want to put the water in motion.] He did not contend, although they were used in this case, that spring rings were—at any rate under all conditions—the most satisfactory means of packing a pump. He had found that the ordinary hemp or leather packing was a little more satisfactory in working. The difficulty no doubt did exist that, where there was any considerable amount of wear in the pump-barrel, and the buckets were wearing rapidly, the springs did have a tendency to break. This could be provided against by frequent examination; but, at any rate, it was just as well to avoid a contingency of that sort, and to get rid of the risk. As to the steel springs breaking, there had been no difficulty with them up to the present. Of course, another purpose that these springs on the top of the valve served was that they prevented the wear and tear that was likely to occur on the top of the seat. They brought the valve back sharp on the base, and prevented jar. But still they did perhaps tend to limit the amount of slip; and he did not say they were the best things to use for the purpose. Regarding the speed of the water through the buckets, he must confess that he could not give it as the result of calculation. Mention had been made of the danger of grease getting into the boiler. The difficulty was very present to his mind when the arrangement alluded to was carried out on his suggestion. He would not then go into detail as to the nature of that arrangement; but he should be pleased to show a sketch to any of the members. In this case it had proved effectual in excluding the grease. Mr. Matthews had asked whether the expansion and contraction of the tank had given rise to any difficulty with the joints of the fittings. He had no knowledge of any trouble in this respect. Mr. Storr inquired what induced the Local Government Board to insist on strengthening the tank by wrought-iron ties. This question was a most interesting one, because it suggested that he should explain the depths of the official mind. Any gentleman who had had anything to do with public departments would agree with him that nothing was more difficult than to give reasons for such suggestions as this. He might say—and he thought it was only due to his late partner and himself that he should say it—that the calculations with regard to the strain on the tank were carefully gone into; and the dimensions adopted were adequate for safety on the ordinary rules and calculations for the purpose. In his own mind, he had no doubt whatever that the tank would have been amply strong enough without the ties.

The members cordially thanked Mr. Griffith for his paper.

The Recent Meeting of the German Association of Gas and Water Engineers.—The correspondent to whom we were indebted for the report of this meeting which appeared in our impression of the 23rd of June, writes to point out that the name of M. Euchêne, the Chief Engineer of the Paris Gas Company, was unfortunately wrongly spelt. He also points out the fact, already evident to our readers from the report on the Berlin Industrial Exhibition which we gave on the 21st ult., that the Gas Section of the Exhibition was under the auspices of this Association, and not of an Association of Gas-Fitters as originally stated. He furnishes us with a summary of Dr. E. Schilling's paper on the Progress of the Gas Industry in Germany (see *ante*, p. 73) and some notes on a paper by Dr. H. Bunte, which we hope shortly to lay before our readers *in extenso*.

The Sanitary Institute.—The preliminary programme of the fifteenth congress, to be held in Newcastle-upon-Tyne from the 2nd to the 9th prox., has been issued. The President of the congress is the Right Hon. the Earl Percy, P.C., D.L., J.P. The meetings will consist of three general addresses and lectures. There will be three sectional meetings, dealing with (1) "Sanitary Science and Preventive Medicine," presided over by Professor W. H. Corfield, M.A., M.D. (Oxon), F.R.C.P.; (2) "Engineering and Architecture," presided over by Sir A. Noble, K.C.B., F.R.S., M.Inst.C.E.; (3) "Chemistry, Meteorology, and Geology," presided over by W. H. Dines, B.A., F.R.Met.Soc. There will also be five special conferences of Port Sanitary Authorities, Medical Officers of Health, Municipal and County Engineers, Sanitary Inspectors, and on "Domestic Hygiene." In connection with the congress, a Health Exhibition will be held; and H.R.H. the Duke of Cambridge, K.G., who is President of the Institute, will perform the opening ceremony on the 2nd prox.

The Disposal of Breeze.—It is very seldom indeed that the item of "breeze" in a gas company's accounts gives rise to a question at the shareholders' meeting; yet this—we had almost said phenomenon—occurred at the half-yearly assembly of proprietors of the South Metropolitan Gas Company last Wednesday, as will be seen by our report in another column. Mr. Livesey supplied the answer to the question put to him, and the matter is only mentioned here to point out that the difficulty in disposing of this residual is experienced elsewhere than in South London. The Gas Committee of the Bolton Corporation have been offering to deliver breeze at their gas-works free of charge; and at a recent meeting of the Council, one of the members asked if it was a fact that the Gas Department were giving "something for nothing." Alderman Miles, the Chairman of the Committee, although declining to admit this, said it was a fact that they were offering it gratis to applicants. It had accumulated to such an extent as to incommode them in their work; and the Committee did not know of any other means of getting rid of it. Why not, one might ask, make it into compressed fuel, or briquettes?

The Bacteriology of Water.—Almost the latest contribution to the literature of water bacteriology, which, according to "Nature," is fast assuming well-nigh unwieldy proportions, is an elaborate memoir in Spanish, from the Municipal Chemical Laboratory of Valparaiso, on an epidemic of typhoid fever in that city. The author of the work—Dr. Mourgues—claims to have successfully tracked the outbreak to the water supply. The chemical analyses showed it to be badly polluted with sewage; and in this condition, without undergoing filtration, it was distributed for dietetic purposes. By resorting to all the most efficient methods at present available for the discovery of the typhoid bacillus in water, Dr. Mourgues states that he "discovered a bacillus which, according to the majority of the bacteriologists, is the cause of typhoid fever." He exhibits, however, some degree of caution in accepting his own conclusions, for he tells us that if it was not the typhoid bacillus, it was the *Bacillus coli communis*, which, according to Rodet, G. Roux, and Vallet, is also capable of inducing typhoid fever. Our contemporary says that Dr. Mourgues has produced an able and interesting report, quite apart from the credit attaching to his investigations; for he has brought together, in a brief and handy form, most of the principal work which has been done in recent years on the bacteriology of water in relation to the typhoid bacillus.

REGISTER OF PATENTS.

Manufacture of Gas from Wood, &c.—Riché, H., of Lisors, Eure, France. No. 10,947; June 1, 1895.

This invention relates to a process for converting into gas by distillation in a closed vessel, "the total amount of the non-mineral elements of the different fuels utilized for industrial purposes."

The characteristic feature of this process lies in the fact that all gases and vapours produced by the dry distillation of the fuel, pass across a very thick layer of incandescent carbon—a residue obtained from frequent preceding distillations, and occupying the lower part of the apparatus. All kinds of fuel behave, says the patentee, in the same manner in his process: The fire woods of any species and age, wood refuse, sprig, peat, lignites, coal, the raw mineral oils (or the residues of their distillation), tars of all kinds, resins, oils, and fatty substances of all kinds, and even kitchen waste, sewage, and night soil, yield by the dry distillation in closed vessels, on the one hand a carbonaceous residue, and on the other hand gases and vapours. By causing these latter fluids to pass across the carbonaceous layer obtained from a large number of preceding charges, maintained very thick and at a high temperature, the patentee contends that a very superior yield in rich and absolutely pure gas is produced, which does not require to be purified, and is ready for immediate use in heating, and incandescent lighting, or for producing motive power. According to the nature of the fuel, and especially according to its degree of humidity, the carbonaceous residue is more or less considerable. This residue (coke or carbon) may at will be withdrawn from the apparatus, or it may be completely gasified, under the form of aqueous gas by injecting, at the top of the generator, either water or steam. There will then remain only the ashes of the fuel.

The apparatus employed consists of a vertical gas-retort (preferably of cast iron, and tapering downwards, but open at its lower end), adapted to be charged with wood from the top, where it is fitted with a hinged lid provided with a balance-weight. The gases obtained escape through an aperture provided at the lower part of the retort, which fits within a cast-iron receiver adapted to collect the gases. These are discharged through a short branch or side tube, leading into a cylindrical chamber or barrel, whence they pass on, through pipe connections, into a gasholder. They are removed from the holder, partly for the purpose of heating the gas-producing retort externally, and partly with a view to their employment as a source of motive power or otherwise. The ashes descend to the bottom of the receiver, where it terminates in a pipe, which dips in the water contained in the tank. This water answers the double purpose of forming a water-seal and of enabling the ashes to be immediately washed, in order to extract the carbonate of potash they contain.

Water-Gas Generator.—Boult, A. J.; a communication from C. Dellwik, of Stockholm. No. 13,764; July 18, 1895.

This invention relates to "a process for the manufacture of water gas, the characteristic feature of which is that the generator and coking chamber are in free and direct communication with each other, and that the generator gas is burnt in a combustion chamber arranged in the generator; the heat produced by their combustion causing a dry distillation in the coking chamber, and the products of distillation obtained during the same period being at the same time also burned in the same combustion chamber." The process provides for the coking of the fuel by the combustion in or around the coking chamber of not only the generator gas, but also of the coal gas given off during the periods of heating, and for maintaining the necessary temperature during the periods of water-gas making, by storing the heat in a mass of loose fire-brick surrounding the coking chamber or in close proximity to it. The fuel being highly heated in the process of coking, requires shorter periods of blowing up; while the periods of water-gas making are correspondingly lengthened. Thus it will be seen that the process of dry distillation is kept up continuously, and a great part of the coal gas is made to mix and pass off with the intermittently developed water gas.

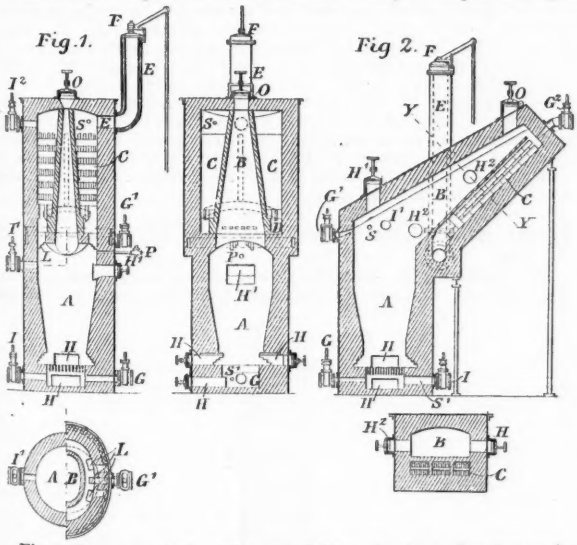


Fig. 1 shows vertical sections at right angles to each other, and a horizontal section on the line X. Fig. 2 shows an alternative construction of generator; the horizontal section being on the line Y.

The apparatus (the shell of which is lined with refractory material) comprises a generator A and a coking chamber B (communicating directly with the generator); also chambers C filled with loosely piled brick or checker-work of refractory material, intended to retain and store up the heat, and a combustion chamber D communicating with the generator A by conduits L L (in fig. 1 only). The apparatus has a chimney E, fitted with a valve F. The generator has doors H for the removal of ashes and cinder. The upper part of the generator in fig. 1 is accessible by means of a door H^1; while in the modification shown in fig. 2, the upper part (or coking chamber B) is accessible by doors H^2.

The fuel is introduced into the generator through the top door O; and in the lower part is the air-inlet pipe G. The secondary air-inlet G^1 is provided in its upper portion. From the latter pipe, the air is conducted (in fig. 1) by tuyeres into the combustion chamber D; while nozzles pass the air from the inlet G^1 to the channels L by which the chambers A and C are connected. The water-gas outlets are I I^1 I^2. S S^1 are steam-inlets. A pipe P admits the oil.

After the fire has been set fairly burning in the lower portion of the generator, the generator and the coking or carbonizing chamber are both charged with coke. Thereupon, fresh air is allowed free admission through the bottom air-opening G, until the coke in the bottom part of the generator is completely incandescent. The air can either be forced in through the opening G or drawn in by an exhaust-fan or blower acting by way of the chimney E. As soon as the gas thereby generated is hot enough to take fire, air is admitted through the middle opening G^1. The products of combustion thus evolved pass (in the apparatus shown in fig. 1) through the space surrounding the coking-chamber B, and by means of the brickwork in that space, heat it to a high temperature. In fig. 2, the products of combustion pass first through the coking chamber B, and then through the chamber C, filled with loosely piled fire-brick or brick checker-work—the chamber in this case slanting beneath the inclined floor of the coking chamber B. In both cases, however, the gases escape through the chimney E and valve F from the apparatus.

As soon as the coking chamber is sufficiently heated, fuel is charged into the coking chamber through the opening O at its top; and this chamber is again filled, as the coke previously contained therein has gone down (in the apparatus shown in fig. 1), in consequence of the combustion taking place in the generator. In the arrangement shown in fig. 2, the fresh charge spreads out, and forms an even bed of fuel over the inclined floor of the coking chamber. Under the influence of the heat to which this chamber is exposed, the charge rapidly gives off all its volatile matter, and is carbonized—*i.e.*, changes into a mass of coke, which can be heated to a high temperature. In proportion as the coke in the generator is consumed, the coked charge sinks down; so that the generator is constantly full. From time to time fresh fuel introduced through the top door O becomes gradually coked, and sinks down into the generator.

In the form of apparatus illustrated in fig. 1, the combustible gas and tarry vapours given off in the coking chamber B pass to the lower part of it, and there mingle with the generator gas ascending from the generator through the conduits L into the combustion chamber D, where they are burnt by the air from G^1—contributing thereby to the heating of the chamber C. In the modification shown in fig. 2, the gases evolved in the coking chamber B mingle with the products of combustion from the generator, and are ignited and burnt by the air from the air-inlets G^2. The products of combustion are carried away beneath the floor of the coking chamber B, which they heat (thus preventing the adherence of the coal to the floor), and finally escape through the chimney E.

When the fuel in the generator is thoroughly incandescent, the escape-valve F and the air-inlet pipes are closed; while one of the gas-outlet pipes and the corresponding steam-inlet pipe are respectively opened. The incoming steam is thus brought into contact with the incandescent coke, and is decomposed into its constituent elements hydrogen and oxygen, of which the latter combines with the carbon of the incandescent coke to form carbonic oxide. To this water gas is added a certain proportion of coal gas and tar vapours, given off in the coking chamber B during the continuous process of dry distillation; the latter being effected by the heat stored up in the checker-work. The steam gradually cools the fuel in the generator, until the temperature is below the point necessary for the production of water gas; and then the steam from the pipe S is cut off, and the gas-outlet pipe I closed—the escape-valve F being opened at the same time, as well as air-inlets G G^1 G^2 to admit air for another period of heating. In this manner, the entire process is alternating and intermittent.

The ash-pit in fig. 1 is of circular section, horizontally. Just above the grate, the diameter of the generator is considerably enlarged; and in this part, the brickwork is drawn or racked in (as shown) to a sectional area only slightly larger than the grate. The object of this arrangement is that the molten or semi-liquid slag, which runs down the walls of the generator, should be prevented from adhering to the walls, and compelled to deposit itself on the grate, whence it can readily be removed. Inasmuch as the grate is of smaller diameter than the narrowest opening between the generator walls, the air is necessarily forced through the heart of the bed of fuel; whereas it would otherwise be apt to follow the generator walls. Besides the gas-outlet I and the steam-inlet S, other openings I^1 and I^2 and a steam-inlet S^1 are provided for the same purpose; so that occasionally the process can be carried on by admitting steam through S, and drawing the gas off through I^1. In this way, any overheating of the lower part of the generator is avoided; while at the same time, by the cooling action of the steam-jet, the clinker is made brittle, and easily removable.

The third gas-outlet I^2 and the oil-inlet pipe P (fig. 1) are used for the production of illuminating gas. In this case, steam is injected through S^1; while through the pipe P oil or petroleum is introduced. The oil vapours thus evolved are mixed with the water gas, and converted by contact with the superheated brick in the chamber C into fixed hydrocarbon gases, which make the water gas luminous.

Gas-Burners for Lighting and Heating Purposes.—Robinson, S. H., of Streatham, S.W. No. 15,512; Aug. 17, 1895.

The principal claim for this invention is: "The combination with gas-burners for illuminating, cooking, heating, or ventilating purposes

of a coiled pipe, through which the gas supply for the burner or burners is made to pass, and which is heated externally by the hot combustion gases and hot air coming from the flame or flames of the burner, so that the gas issues from the latter in a highly heated condition." The coiled pipe referred to can be formed and arranged in a great variety of ways, says the patentee, according to the purpose to which it is to be applied—whether for lamps for illuminating, or for burners for heating or cooling and ventilating purposes.

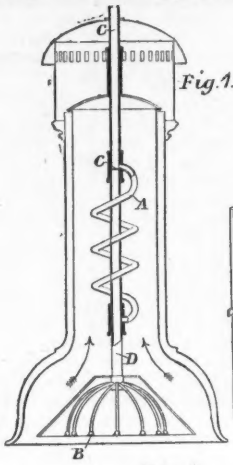


Fig. 1.

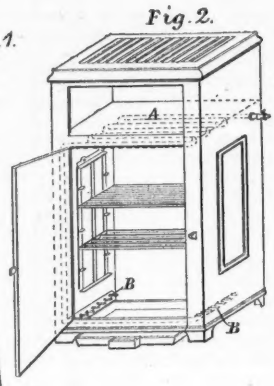


Fig. 2.

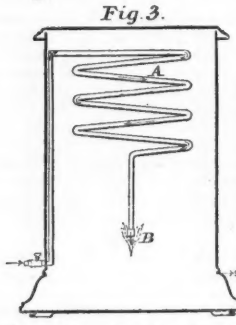


Fig. 3.

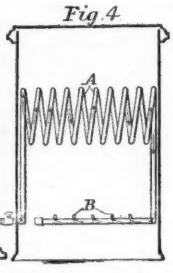


Fig. 4

On drawings accompanying the specification of the patent are shown, by way of example, some ten or twelve various arrangements of the pipe-coils.

Fig. 1 (herewith) shows a sun-burner gas-lamp with the invention applied to it. To the gas-supply pipe C, closed by a partition, is connected the upper end of the helically coiled pipe A, the lower end of which is connected to the pipe D, leading to the sun-burner B, so that the gas is caused to pass through the coil on its way to the burner. As the hot combustion gases from the latter and the hot air pass in close contact with the outer surface of the coil, the gas passing becomes highly heated before issuing from the burner.

Fig. 2 shows a perspective view of a gas cooking-stove, in which the heating coil A, through which the gas passes on its way to the burner-nozzles B, is arranged as a horizontal, flat, or zig-zag coil in the upper part of the stove. Fig. 3 shows a vertical section of a heating stove, in which the coil A is arranged in a vertical, flat, or zig-zag coil (or it may be a circular or oval coil) over the single burner-nozzle B. Fig. 4 shows a similar stove, with the circular pipe-coil A arranged horizontally over the row of burner-nozzles B.

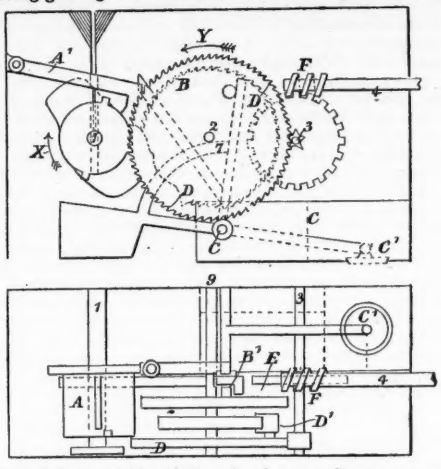
Sterilization and Purification of Water.—Sleen, N. van der, of Haarlem, and Schneller, A., of Alfen, Holland. No. 16,308; Aug. 30, 1895.

This invention relates to apparatus to be used for sterilizing and purifying water by means of ozone; and in carrying the invention into effect, the patentees prefer to make use (as far as concerns the generation of the ozone) of the apparatus described in patent No. 23,297 of 1894, in which the air or oxygen to be ozonized is caused to pass through a number of chambers, one after the other, and is cooled before passing into the second, third, &c., chamber. In this apparatus each of the ozonizing chambers contains a number of electrodes; and each of the latter is connected to a specific resistance formed by liquor. The purpose of this arrangement is to prevent the formation of sparks, and to allow of silent discharges only, as described in the patent cited. The present invention refers, in general, to the means for bringing the ozone in intimate contact with the water to be sterilized and purified.

Coin-Freed Gas-Meters.—Smith, C.; a communication from L. P. V. Madsen, of Copenhagen. No. 16,370; Aug. 31, 1895.

This "automatic machine" is so constructed as to be rendered capable of operation by the insertion of (not exceeding twelve) pennies, the duration of operation being dependent upon the number of coins inserted.

Mounted on the axis 1 is a cylinder A, provided on its front end at opposite points with two projections, and on its opposite end with two pins also arranged opposite one another. At opposite points, two notches are cut in the cylinder to receive through a shoot the coin by which the apparatus is operated; the notches being connected together by an opening, to facilitate cleaning. The axis 1 is provided with a handle outside the case of the apparatus, by which it may be turned when freed. Resting on the cylinder A is the bent free end of a stopper-lever A; which, when the cylinder is revolved with a coin in it, is raised by the coin, but otherwise engages with one of the notches, so preventing the useless revolution of the cylinder. The spindle is prevented from revolving in the wrong direction by a toothed wheel having a cam engaging with it. Mounted loosely on an axis 2 is a wheel B, toothed on the greater part of its circumference—in the example shown, it has 45 teeth—and provided on its back with a projecting pin B^1. The axis has also mounted on, and secured to it, a toothed wheel D, gearing with a wheel on the axis 3, which axis also carries a toothed wheel E, having gearing therewith a screw-threaded spindle 4, connected



to, and operated by, suitable clockwork of any ordinary construction. The wheel D carries a pawl D^1, which engages with a wheel mounted on the hub of the wheel B in such a manner that the wheel, and with it the main wheel B, are rotated in one direction through the medium of the wheel D when the latter is rotated by the screw 4, but is free to be moved in the opposite direction independently of the toothed wheel D or the mechanism connected with it. The valve arrangement C, which is to be governed, consists of a three-armed lever, having one of its arms connected to the valve C^1 to be operated. The second arm of the lever, which is parallel to the other one, carries a counterpoise; while the third arm, which is at right angles to the other two, engages with the projecting pin B^1 on the wheel B, in such a manner that the valve is normally held by it in a closed position. The second and third arms are connected by a curved piece, which serves as a support for an inclined arm carrying an adjustable screw.

In operating apparatus constructed as described, a coin is inserted through the shoot into one of the notches in the cylinder A, from which it projects. The cylinder is then rotated through half a revolution (in the direction indicated by the arrow X), by the handle on the axis 1, when the coin will act upon the inclined plane on the under side of the stopper-lever, and raise the latter in such a manner that the projection can pass the narrow side. After having passed the lever, the coin acts upon the first tooth of the wheel B, revolving this the distance of three teeth in the direction of the arrow Y, thereby disengaging the projection B^1 from the third arm, and permitting the counterpoise to operate the three-armed lever and the latter to open the valve C^1, but not until one of the projections on the cylinder has passed a screw carried by the arm, which happens immediately the coin has passed the wheel B and has consequently reached a point where the coin cannot be removed. The screw referred to in the end of the arm is provided so that the engagement of it with one of the projections may be such as will permit the valve to open slightly or not as required.

When the cylinder A has been turned through half a revolution, the coin falls into a sliding box, and another may be inserted in the other slot, and the wheel again operated a distance of three teeth. The wheel B has teeth only on part of its circumference, and therefore cannot be completely revolved; this provision being made, as otherwise the projection B^1 would eventually assume a position on the wrong side of the arm. The pawl D^1 prevents the wheel B turning backwards, but allows it to be returned to its starting point and the valve closed when the gas paid for has been consumed, as the axis is geared to the operating clockwork, which operates it at such a speed that the wheel will be turned back through a distance of three teeth during the time a penny-worth of gas is being consumed.

Gas-Burner Regulator.—Cayrol, J., of Paris. No. 17,670; Sept. 21, 1895.

This gas-burner is arranged to be regulated by means of a screw-threaded cap, as shown in the engraving. The lower part of the

burner A has three screw-threaded portions, the lowest adapted to fit on the gas-supply pipe. A screw-cap B screws, to a greater or less

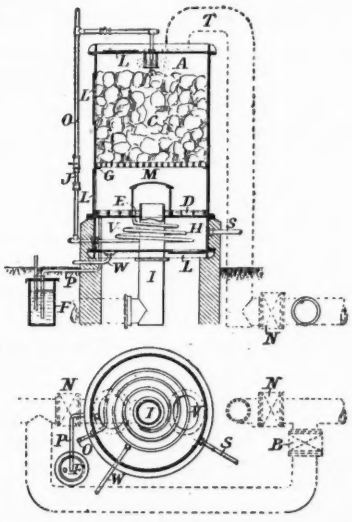
extent, upon the top part of A, which is formed with a slot E, through which alone the gas can pass to the burner. The gas-chamber C, which allows the gas to expand before passing to the burner, is screwed upon A by the centre screw-thread. The gas on entering, impinges against the top of the cap B; and it is thus compelled to pass through the slot E in the valve-casing A before reaching the burner proper D. A uniform outflow of gas is secured at will, by screwing the cap B higher up or lower down to suit requirements.

Acetylene Gas Generator and Container.—Thorn, F. S., and Hoddle, C., of Camberwell New Road, S.E. No. 3142; Feb. 12, 1896.

This acetylene gas generator consists of two cylinders suitable for holding water, with an inverted cylinder inside each, connected by a U-shaped tube passing from the top of No. 1 cylinder, which acts as the generator, through the bottom of each to the top of No. 2 cylinder, which acts as the gas-container. A stopcock is inserted in the pipe between the two cylinders, and a T-piece and stopcock is added just beyond the inlet-pipe to cylinder No. 2, to provide an outlet. Calcium carbide is placed in a perforated holder, suspended from the top of the inverted cylinder in No. 1. Both outer cylinders being filled with water, and the stopcocks turned on, the gas will be generated in No. 1, as soon as the inverted cylinder sinks sufficiently to allow the carbide to reach the water. The outlet stopcock should then be closed; and immediately the gas is passed on to No. 2, and on this becoming full, the gas fills No. 1. When this is done, the holder containing calcium carbide is lifted out of the water—automatically suspending further action until some of the gas is used, when the carbide returns to the water, and the generating proceeds until again full. Upon turning off the stopcock between the cylinders, the generator can be opened and recharged—No. 2 still acting as a supply to burners which can remain alight during this operation.

Mixing Oil Vapours with Coal Gas.—Cripps, F. S., of Great George Street, S.W. No. 6008; March 18, 1896.

The patentee's proposal is to provide for the passage of the whole volume of gas to be enriched through the apparatus without the special aid of injectors; and to combine a coil and evaporating disc, so that the liquid to be vaporized is primarily heated when passing in an upward direction through the coil in the heating chamber containing low pressure steam, before it overflows on to the evaporating disc above.



The apparatus consists of an iron or steel vessel divided into three chambers, of which the lowermost is termed the heating chamber, the one immediately above is the mixing chamber, and the uppermost the oil-arresting chamber. The heating chamber H and the mixing chamber M are separated by a division-plate D (termed the evaporating disc). The mixing chamber and the oil-arresting chamber A are separated by a sieve or grid G, upon which rests the coke or other scrubbing material C. The oil-pipe O enters the lower part of the heating chamber, and then coils round forming a volute V, gradually rising, until it enters the evaporating disc at the point E, where the oil is delivered and flows outwards over the surface of the disc; being made to travel backwards and forwards a long distance over the heated surface, so as to drive off the vapour. The outlet-pipe P for surplus oil, leads from the disc to a syphon F outside; whence it can be returned to the store-tank, if required. The pipe S admits low-pressure steam into the heating chamber, for heating the oil in the volute, and driving off the vapour by heating the disc. The condensation water is drained away by the pipe W.

The gas inlet-pipe I passes through the bottom of the vessel, the heating chamber H, and the evaporating disc D; and it delivers the gas direct into the chamber M, where it is thoroughly mixed with the oil vapour. The enriched gas then passes through the grid G, and into the chamber A, where any oil held in suspension and not permanently mixed with the gas is taken up by the scrubbing material contained therein. The gas then passes away by the outlet T. To afford access to the interior of the apparatus, manlids L are provided.

The method of operating the apparatus is as follows: By opening the cock of the sight-feed J, oil is admitted into the coil V, and thence on to the evaporating disc D, where it passes backwards and forwards along circular passages until it reaches the outlet, where the unvaporized oil (if any) escapes to the syphon F by the pipe P. Low-pressure steam is admitted into the steam-space H, primarily heating the oil in its upward passage through the coil V, and then vaporizing it as it flows over the disc D; while at the same time the valves N on the gas-mains are opened and B shut, thus causing the whole volume of gas to pass through the apparatus without the employment of any injectors or other special power for forcing the gas through the apparatus. The oil vapour is incorporated with the gas in the chamber M, and then passes through the grid G and the coke C above. Should there be any excess of oil in the vapour, it will be arrested by the material C in the chamber A, and thence returned to, and re-evaporated from, the disc D.

Gas-Engines.—Auriol, P., of Paris. No. 7147; April 1, 1896. Date claimed under International Convention, Sept. 19, 1895.

The claims for this invention are for: (1) A gas-engine characterized by the accomplishment, in a single revolution, of the four periods of the cycle of compression gas-engines; the third period comprising an expansion, the volume of which, according to requirements, may become from one to two of the volume of admission—the whole being realized by the action of two pistons moving in opposite directions in a single cylinder, and provided with rollers moving upon a rolling path of elliptical form profiled for obtaining the expansion required. (2) The balancing of the driving forces or momenta, and of the momenta or forces of inertia, of the parts in motion by the diametrically opposite actions of the rollers acting upon lever-arms of equal length. (3) A distributing device, with an automatic exterior joint, with automatic compensation for the wear, and with moderate friction proportional to the tightness to be obtained—consisting of a fixed valve-face and a disc, provided with a passage which can slide in the mass, with little friction and with a tight joint. (4) The application of the motor as a driving-wheel, by placing it at the centre of the wheel of a vehicle.

Mixing Gas and Air.—Mitchell, J. M., of New York. No. 7901 April 14, 1896.

This device, whereby air and gas can be mixed in any desired proportions, consists primarily of two compressors adapted respectively to force air and gas into a common receptacle in such a manner as to be thoroughly mixed. The compressors are operated at the same speed; and the quantities of air and gas are regulated (without changing the speed of the compressors) by moving certain valves, which control the ports of each compressor.

Automatic Device for Gas-Lighting.—Loewenberg, G., of Berlin. No. 9056; April 29, 1896.

Alluding to his invention, the patentee remarks in his specification: "It is a well-known fact that, by means of a small quantity of platinum black, or spongy platinum, illuminating gas can be lighted, if the platinum black or the spongy platinum, or a mixture of both in combination, with a thin platinum wire is arranged in any corresponding form in such a manner near the outlet of any gas-burner that, on opening the cock, the gas passes thereover with such friction that the platinum black and spongy platinum, as well as the platinum wire therein, are brought to a glow, and light the flame."

As, however, the platinum black soon loses its power of acting in this way, the patentee proposes to make his lighting pellets of spongy platinum or platinum black, or a mixture of one to two parts of these substances, of which 30 parts are mixed with 70 parts of an incombustible, porous material—such as burnt and finely pulverized alumina, infusorial earth, lava, meerschaum, asbestos flour, or the like—from which latter materials dampness is removed by means of sulphuric acid, or by exposing them under air closure to a current of sulphuric acid vapour. It is said that pellets thus prepared have the advantage that neither melting nor crumbling can take place; also they cannot be influenced by dampness of the air, because the particles of sulphuric acid remaining in the pores of the porous substance draw up any dampness, which they give out again during the glowing of the pellets. The mixture is then brought into appropriate forms, and pressed into pellets under high pressure. Through the pellets passes a platinum wire; and they can then be used for self-acting lighting apparatus.

Making Pipe-Joints.—Wood, J., and Clark, W., of Hackney. No. 9185; May 1, 1896.

In order to provide means for holding a socket pipe against another pipe when soldering or making a joint to connect them together, the patentees propose to use a screwed rod passing through a mandrel having split or slotted ends. One end of the rod carries a wedge-shaped piece of metal, which engages in the slotted end of the mandrel. A wedge, having projections which engage upon the screwed rod and enters the slot in the other end of the mandrel, is then used in such a way as to cause the wedges to expand the ends of the flexible mandrel by means of a thumb-screw or nut upon the screwed rod.

Rotary Scrubber-Washers.—Kirkham, H., of Queen Victoria Street, E.C. No. 10,822; May 19, 1896.

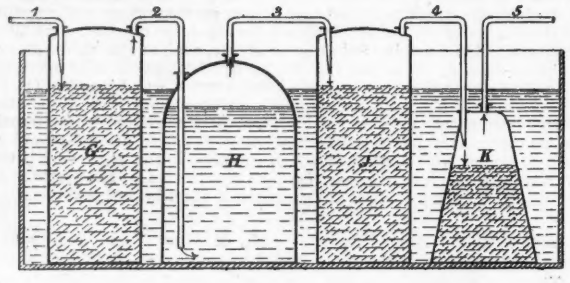
This invention relates to scrubber-washers, "with separately removable cages or baskets adapted to contain scrubbing material."

The usual form of this apparatus is retained; the tanks of the scrubber-washer containing in their lower portions water or liquor, which gradually passes from tank to tank through central openings, which also allow of the passage of gas from one tank to the next. Pairs of discs are so mounted on a rotary shaft that one disc rotates in contact with an annular bearing formed on the adjacent tank wall, while the other disc is some distance from the other wall. Between each pair of discs, sector-like cages or baskets are secured, constructed so as to contain scrubbing material, such as coke. The gas is compelled, in passing from one tank to the next, to travel through the perforated portion of one disc, up through the upper cages or baskets, and down between the other disc and the adjacent tank wall. Each cage or basket consists of a pair of sector-like sheet-metal plates, connected together by bars to form the sides and bottom. The top (formed by a removable grid-like lid composed of side plates and flat bars) is held in position by short bolts and nuts, which also secure the cage or basket plates by

means of which it can be readily lifted. Each cage or basket is so secured between the discs by short bolts that, upon removing the bolts, any cage or basket can be taken out of its place between the discs opened; and the dirty material discharged and fresh material substituted, or the same material may be replaced after being cleansed.

Purifying Acetylene Gas.—Bauweraerts, E. F. J. C., of Brussels. No. 11,706; May 29, 1896.

The patentee remarks that acetylene gas contains in varying proportions (according to the method of producing the carbide of calcium) impurities such as ammonia, carbonic oxide, hydrogen, sulphuretted hydrogen, arseniuretted hydrogen, and carburetted hydrogen; and these impurities have the drawback of producing with most ordinary metals, certain compounds of an explosive nature. The object of this invention is to overcome these objections by treating acetylene so that "it is rendered absolutely pure, and consequently quite innocuous, while the gas has imparted to it at the same time the maximum of illuminating power."



This purifying process consists: First, in cooling the acetylene and absorbing its impurities, by means of a suitable absorbing agent, such as caustic lime, or lime hydrate saturated with sulphate of iron and mixed with sawdust; secondly, in passing the gas through water which has been acidulated with 50 per cent. of hydrochloric, nitric, acetic, citric, or salicylic acid, for the purpose of removing the ammonia from the gas; thirdly, in removing the acidity of the gas by means of a suitable absorbent, such as caustic soda or potash; and, fourthly, in drying the gas in a suitable material, such as sawdust, bran, or other absorbent material.

The vessel or basin G in the illustration contains a mixture of materials, such as caustic lime or lime hydrate saturated with sulphate of iron with sawdust, for absorbing the heat and the impurities of the gas. A pipe I, having a pointed outlet, supplies the acetylene gas at its temperature of production, and injects it into the purifying materials. The gas cooled and partly purified, passes by the pipe 2 into the bottom of the vessel H, containing water acidulated with hydrochloric, nitric, acetic, citric, or salicylic acid, which removes the ammonia from the gas. Then the gas passes by the pipe 3 into the vessel J, containing absorbing material, such as caustic potash or caustic soda. The gas now freed from its acidity and from its impurities, passes by the pipe 4 into the vessel K, wherein it is completely dried by any absorbent, such as sawdust, bran, or the like. The pipe 5 conveys the pure acetylene gas either to a holder or to liquefying apparatus. The various parts of the purifying apparatus are enclosed in a basin or trough filled with cold water, which maintains them at a normal temperature.

Automatically Opening and Closing the Gas Supply to Stoves.—Davis, C. W., and Turner, H. C., of Camberwell, S.E. No. 11,974; June 2, 1896.

This invention has for its object the construction of a gas-regulator for an ordinary gas-ring burner, so that when any utensil is placed on the burner, it moves a small lever and opens the gas-inlet valve, so as to allow the gas full power, and when the utensil is removed, the action of lever is reversed, and the inlet is closed by a cap, and the gas passes only through a small jet sufficient to light the burner automatically when a utensil is again placed upon it.

APPLICATIONS FOR LETTERS PATENT.

17,156.—Hamer, F. G., "Prepayment gas-meters." Aug. 4.

17,194.—Voelker, W. L., "Materials for incandescing mantles, and processes for manufacturing the same." Aug. 4.

17,208.—Lasnier-Hubert, P., "Producing light for a certain length of time." Aug. 4.

17,212.—Etchells, J. C., "Gas and oil engines or motors." Aug. 4.

17,367.—May, W. C., and Offord, W., "Incandescent smoke or vapour consumer and downward draught preventer." Aug. 6.

17,373.—Alcock, A. J., Smith, A. A., and Haines, H., "Lamp and gas chimneys or globes." Aug. 6.

17,384.—Pereire, G., and Lavezzari, A., "Gas motor engine for the propulsion of road vehicles, tramway cars, and for other purposes." Aug. 6.

17,428.—Halse, A. C., "Generation of gases." Aug. 7.

17,450.—Clarke, W. C., "Generating acetylene gas." Aug. 7.

17,469.—Holliday, T., "Gas-burners." Aug. 7.

17,481.—Schmidt, J., "Turbine-wheels for steam or gas turbines." Aug. 7.

17,499.—Bennis, E., "Meters or motors." Aug. 7.

17,530.—Helps, G., "Regenerative furnaces for heating gas-retorts and the like." Aug. 8.

17,596.—Thompson, W. P., "Incandescent body or mantle for incandescent gas-lights. (A communication from W. Buddëus.) Aug. 8.

17,605.—Wheatley, W. H., "Manufacture of incandescence bodies for illuminating purposes." (A communication from C. Schmid.) Aug. 8.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

Mr. Young on the Permanency of Illuminating Gas.

Sir,—In Mr. William Young's most interesting, able, and valuable paper upon the "Permanency of Illuminating Gas," recently read before the North British Association of Gas Managers, the following statements are made:—

1.—The permanency of an illuminating gas depends upon its vapour tension.

2.—That this depends upon the vapour tension of its constituents.

3.—The various components of coal gas do not act as simple diluents of one another; they act more like mutual solvents. The gas acts more as a whole—as if it had a vapour tension of its own, which may be called the "combined vapour tension."

4.—That at any given temperature, a certain pressure must be applied to the gas to induce condensation to begin; and this pressure is the combined vapour tension.

5.—If the combined vapour tension of such a mixed gas is such as to be in excess of the pressure of the atmosphere at the lowest temperature, and under the conditions to which such a gas is subjected during storage and distribution, then, according to a gas manufacturer's view, such a gas would be a permanent gas. On the other hand—*mutatis mutandis*—a portion of the mixed gas would pass from the gaseous to the liquid, or even to the solid, form; and such a gas would not be permanent from the manufacturer's point of view.

6.—Therefore, to ensure permanence, the combined vapour tension must be high enough.

7.—The amount of this combined vapour tension—that is, the amount of pressure—requisite to induce condensation to begin depends upon (*a*) temperature; and (*b*) the amount of solvent affinity which the respective gases and hydrocarbon vapours have for one another.

8.—That the mutual solvent action has two other effects: (1) That so long as the mixed vapour remains uncondensed, "things" remain in it uncondensed, being diffused or suspended or dissolved in our coal gas, which would have condensed, at any rate in part, if they had been pure or mixed with more inert gases. (2) That when condensation of any one component does begin to take place, the liquid formed interferes, by its direct solvent action, with the remainder of the vapour, and causes constituents of that vapour to condense out which would not but for that direct solvent action have condensed out of their own accord under the particular existing circumstances of temperature and pressure.

9.—While the vapour tensions of isolated hydrocarbon fluids, and the volumes of their vapours diffusible through a gas at any given temperature bear a relation to their boiling-point—the lower the boiling-point, the higher the vapour tension and the larger the volume of their vapours diffusible through a gas—yet, on the other hand, with commingled hydrocarbons having different boiling-points, the boiling-point and the combined vapour tension are only about the mean of those of the mixed fluids, and vary with the relative proportions of the different hydrocarbons present in the mixed fluid; these results being due to the solvent affinity of each hydrocarbon for the others, the solvent affinity of each hydrocarbon modifying the vapour tensions of the others.

It seems to me, Sir, hardly possible for a writer upon a technical subject to convey his meaning to his readers more clearly and concisely than has Mr. Young in the foregoing passages of his paper; and I, who am a novice in these matters, feel greatly indebted to him for their lucidity.

At a later stage of the paper, Mr. Young, having repeated the statement numbered 9 as above, proceeds: "Such being the case, it is evident that, upon the addition of the vapour of a liquid hydrocarbon to a gas already containing vapours in diffusion, any one of whose vapour tensions was just sufficient to hold it in diffusion and no more, then, unless the vapour tension of the added hydrocarbon vapour was sufficiently (and in most cases extremely) high, the tendency would be for the added vapour to cause the precipitation of a part of the denser vapours already present in the gas." From which it is evident that Mr. Young is speaking of the further addition of vapour to a saturated mixture of vapours; for he has already stated (see Nos. 4, 7, and 8) that, in a mixture of vapours, the solvent affinity of each for each prevents such a condition of things obtaining in the case of individual vapours until the combined vapour tension of the mixture has been reached—in other words, until the combined vapours are saturated, until, in common parlance, the gas is saturated. This is an aspect of the subject which, although of the highest scientific importance, would seem to possess rather an academic than a practical interest for those who are concerned with questions of coal gas enrichment.

Mr. Young proceeds to say that his "object in drawing attention to this point is that there is an idea, and a growing idea, that the addition of a vapour of a liquid hydrocarbon to ordinary coal gas has the property of, in some occult way, raising the vapour tension of the hydrocarbons already held in diffusion through the gas, and more particularly that of the vapour of naphthalene." It is not, on the surface, clearly apparent in what respect such a view would not be the logical conclusion from Mr. Young's premises; but, assuming that anyone so proposing to raise the tension of the existing vapours in a sample of coal gas must have reason to believe that the vapour to be added itself possesses a higher tension than those already in diffusion, the clue to the fallacy would seem to be found in the words "and more particularly that of the vapour of naphthalene."

From these words, I gather that the growing idea referred to is that individual tensions of individual vapours in a mixture can be raised apart from others, leaving the latter unaffected; and that naphthalene vapour can thus be held in diffusion further than the additional tension which the added vapour communicates to the compound gas would lead us to expect. But such an idea would both affirm and deny that mixed hydrocarbon vapours possess mutual solvent affinities resulting in a combined vapour tension, and would therefore be absurd.

These questions of the physical conditions under which hydrocarbon vapours exist in coal gas are full of interest; and I have of late

read much of what has been written in the past upon the subject, together with current references. But I have met with no such view or idea as the above, so mercilessly pilloried—but, if it really does exist, of necessity pilloried—by Mr. Young. Further, if the very modest contributions which I have myself made to the discussion of the subject may be alluded to, it has been my intention and endeavour to emphasize the necessity of stopping short of the saturation-point of the mixed vapours—*i.e.*, of the ultimate or maximum combined vapour tension of the hydrocarbons in diffusion in enriched coal gas, at ordinary temperatures and conditions of supply, if any useful purpose is to be served by vapour enrichment.

Pardon my saying, Sir, that I find in your "Editorial Notes" evidence of an impression that it has been proposed to add to "coal gas capable of throwing down naphthalene, quantities of the vapours of fluid hydrocarbons short of the point of their own saturation." You have, Sir, the advantage of me in breadth of survey of current topics; but, so far as I am aware, it is not this point which has been in contemplation, but that of combined saturation. The results of Mr. Young's attempts to employ naphthalene vapour, in association with other hydrocarbon vapours presenting high vapour tensions, for carburetting atmospheric air are so interesting, as evidencing the physical condition of the precipitated naphthalene (which you, Sir, so aptly label "sleet"), that we can only wish to know fuller particulars of the experiments themselves, and more especially of the "certain conditions" referred to.

This brings me to the point of the negative evidence adduced by Mr. Young in support of his argument, in the following passage: "The fact that the addition of the vapours of liquid hydrocarbons, in quantities considerably short of saturation, does not prevent naphthalene deposits during distribution of the gases, is further negative evidence as to the effect of these vapours holding the naphthalene in diffusion any further than the additional tension which they communicate to the compound gas would lead us to expect." Surely no one expects anything beyond this! Does anyone, in fact, count upon as much? For, unless indeed the presence of naphthalene deposits is to be always accepted as proof that the gas from which the deposit was derived had reached its limit of combined vapour tension—*i.e.*, its point of saturation—before it parted with its naphthalene (in the case of 16 to 18 candle coal gases, even at the freezing-point, a somewhat incredible supposition), although the saturation-point of such gases may be far sooner reached as temperature falls than is generally supposed, for there seems to be little or no experimental evidence on the point, it follows that supersaturation of hydrocarbon vapour is not the sole, probably not the chief, cause of the precipitation of naphthalene. Gas makers, I think, generally agree that increased enrichment is followed by reduced deposits; and if it be true that the richer coal gases of the North are less attended by such deposits than the poorer gases of the South the case for other causes would appear to be strengthened.

What are these more remote causes? They are generally believed to be two—viz., friction and condensing aqueous vapour. Friction, however, is unavoidable; and desiccation in bulk seems hardly possible.

But we want the naphthalene in the burner, not in the service-pipe; and some approximation to that consummation has, by common consent, been effected by addition of lighter hydrocarbon vapour, which, by imparting additional tension to the combined vapours, seems to enable the naphthalene vapour to resist these adverse influences in greater degree. As is now generally known, the problem has also been attacked in a very novel and interesting manner by Mr. Botley at Hastings.

I am at the present time watching the effect of vapour enrichment in the condensers upon naphthalene deposits in these works. The experiment has been running day and night continuously for weeks, upon the total summer output. Remembering that the summer has been unusually hot, I prefer to speak with due reserve; and merely say that the deposits have decreased, while most certainly the normal illuminating power at the outlet of the purifiers has improved. In short, if we are not keeping more naphthalene vapour in diffusion in the gas, we are retaining "things" which were lost before, and which well repay our outlay, since a volume of vapour which added at the inlet of the gasholder gives x enrichment, returns when added in the condensers $2x$, $3x$, and even $4x$.

Rotherhithe Gas-Works, Aug. 14, 1896. A. F. BROWNE.

Mr. Damon and the Evans Photometer.

SIR,—Mr. Damon has admitted the main part of my contention—viz., that the Evans photometer, when used with proper surroundings, gives correct results. Yet, notwithstanding this, he writes that it is past all understanding that it should anywhere be tolerated.

Now, inasmuch as this instrument was deliberately adopted by the Gas Referees themselves, he appears to have very small respect for their capacity; and his endeavour to throw the responsibility of the alterations made by himself on these gentlemen, assumes the form of a superfluous modesty. The Evans photometer is so well known in its construction, that anyone can accurately understand the results obtained; but no one knows the precise nature of Mr. Damon's screens and other modifications, and therefore no estimate can be formed as to the reliability of his results. Mr. Damon almost leads us to think that he believes, as an officer of the London County Council, that he holds a brief to make the gas he tests appear of as low an illuminating power as possible; and his alterations are certainly open to the suspicion of being devised to secure that end.

If every photometer has to be varied in construction to suit the circumstances of its situation, no two instruments can be alike, and a standard photometer is impossible. It is evident, therefore, that it is the room, and not the photometer, that requires to be modified; and this remark applies to every instrument in use—whether the Evans, Letheby, or any other—the only difference being that the Evans photometer, in a properly ventilated room, as prescribed by the Board of Trade, is less likely to be affected by external influences than others. Moreover I apprehend that it is not within the province of a Gas Examiner to alter any photometer which the Gas Referees have prescribed for his use. Any modification of it, however apparently insignificant, should primarily emanate from these gentlemen, who, from the very nature of their appointment, are thoroughly impartial in their judgment.

Mr. Damon finishes up, as one might expect, with a Parthian shot at the Evans photometer and the Dublin Gas Company. Let me remind him that the serious charge against the Gas Company he makes in his letter, he made previously in his evidence given before the Committee of the House of Lords on the Dublin Corporation Bill. The Committee were evidently so little impressed with his evidence on this point, that they promptly threw out the gas clauses of the Bill, without calling on Mr. Littler, on behalf of the Company, to offer any rebutting evidence.

Finally, I deny the correctness of Mr. Damon's assertion that "at the present time it is admitted on all sides that there is no certainty that the results are within 10 per cent., and in some cases even more," unless he refers to the candles, and not to the photometer.

Vincent Works, Westminster, Aug. 14, 1896. WILLIAM SUGG.

The Estimation of Nitrogen in Coal Gas.

SIR,—I have no wish to prolong a discussion that is not productive of much fresh information; but, having shown that gas analyses with high percentages of nitrogen and those without any, may (on grounds of probability) be regarded critically, I would say, for the benefit of those readers of the "JOURNAL" who may not have a practical acquaintance with its gasometric determination, that it is surrounded with many sources of error. If the explosions be too violent, some of the nitrogen is burned into nitrogen oxides, and would be estimated as something else; on the other hand, if the explosions were incomplete, unconsumed combustible gases would appear as free nitrogen.

There is no need for me to dilate upon these difficulties, which are well known to those who have practised gasometric analysis; but they fully justify a critical attitude towards analyses that would, on the one hand, indicate a large air dilution, and, on the other, the necessity for a new statement of the distribution of the coal-nitrogen. I contend that, in view of the difficulties of the nitrogen determination, no gas should be condemned as being air-diluted unless with some other corroborative evidence—such, for instance, as that provided in his case by Mr. Pryce (viz., the use of an independent method); nor could the possibility of distilling coal at high temperatures without the production of free nitrogen be considered as at all satisfactorily proved without some other evidence showing how the coal-nitrogen is, in that case, disposed of.

I am sorry that no evidence has been offered on this latter point, which is the more interesting as it relates to coal distilled in a coke oven, and it is generally understood (and I have always found it to be so) that the coke from coke ovens contains less nitrogen than gas coke, therefore leaving more to be accounted for in the volatile products.

1, *Victoria Street, S.W., Aug.* 15, 1896. LEWIS T. WRIGHT

The Principles of Gas Heating.

SIR,—On p. 267 of the "JOURNAL" for the 11th inst. there are several statements which are not only seriously incorrect, but are also calculated to injure, in the minds of those unacquainted with the subject, the position and reputation of a science that has made as great and important advances during the last ten years as any other known.

The statement that "the question of efficiency of converting the heat of burning gas into warming effects, remains precisely where it has been any time these last thirty years or more," is one which no one who has the slightest knowledge of the subject would or could entertain for a moment. As the original patentee of the hollow fire-clay balls, now universally used, such a statement might be taken in the light of a personal attack. The radiating power of these fires has been increased, by successive improvements, to more than double what it was even ten years ago. In addition to this, the improvements in the utilization of the waste heat are in themselves sufficient to again nearly double the actual efficiency of the fire; while the advantages of an open fire and radiant heat in large proportion have been retained.

The statement that "the flame is partially extinguished by the cooling action of an inert surface" may be correct for the first few minutes, until this "inert surface" attains, as it rapidly does, a temperature closely approximating to that of the flame itself; and then it ceases. The "unconsumed gas," of which so much is made, has no existence when the fire is properly incandescent. In the report of the "Lancet" Special Sanitary Commission, every analysis shows that the combustion in every incandescent fire tested is absolutely perfect; and no trace of imperfect combustion could be detected in the flue gases in any case.

If the "frequency with which gas-fires are turned out of houses" were a fact, the enormous and rapidly-increasing demand for open gas-fires would have no existence. That the demand does exist, and its importance to gas manufacturers, are matters too well known to need further comment. At the smallest estimate, at least 100,000 gas-fires and stoves are made and sold every year in England alone.

As regards the "luminous flame for heating purposes," most important improvements have recently been made in this direction, and this without returning to the close-stove form, which, from the small proportion of radiant heat evolved, is anything but pleasant or desirable for domestic use. The value of pure radiant heat is very plainly stated in the "Lancet" report: "Radiant heat conduces most to healthy conditions. We are bound to entertain a preference for gas heating appliances in which the effect is due to radiated heat only."

How the "total heating effect" is to be "increased by heating the air and gas before burning," is not stated; and as the fundamental principle that a certain quantity of gas, properly burnt, gives the same total heat under all conditions, is well known, it would require more than a mere statement to prove that the laws of Nature are suspended. As a matter of fact, stoves burning luminous gas in open flames are now in the market which will, by radiant heat only, roast large joints, and give an efficiency equal to that of the best open fires of any kind. But still these stoves are not, and never will be, universally used, as they have not the appearance of an open fire. The Siemens gas and coke fire, now long extinct, was undoubtedly a mistake, as a single

experiment would have shown what was known before—that coke burns better without gas than with it, in a modern fire-clay lined grate.

It is much too late to go back to regenerative burners in an enclosed chamber. Their vagaries are only too well known to make their re-introduction popular, whether for heat or light. It must not be forgotten that for more than twenty years stoves have been, and still are, made which give the total theoretical duty of the gas consumed, in useful work, and which at the same time remove the sulphur products evolved. But even these are not universally used, simply because of the deficiency in the radiant heat, and the fact that no close stove will keep the floor of a room at a comfortable temperature. Hence the American fashion of putting the feet on a level with the head in rooms heated by close stoves. The fact that stoves give a high duty as compared with an open fire, is one that was well known generations ago; but it has not made them popular.

So far from the art of heating by gas being in the same position as it was thirty years ago, it may safely be said that twenty years ago it had no practical existence; and in this time its use has multiplied more than a thousandfold. If the writer of the article could see what is being done in a first-class manufactory—the precision of the work, the time and money spent on exact experiments, and the detail of the purely scientific work done—that article would never have been written. The days of rule-of-thumb and blind guessing are past; and the use of gas for heating purposes of every kind is on a sound scientific basis, and fills a position which no other fuel known can fill at present. It is not only an instrument of precision in the strictest sense, used on a very large scale, but it is a household requisite, which, as regards its satisfactory nature, can easily be estimated at its true value by the number of fires and other appliances actually on hire from any large gas company—*i.e.*, those remaining after the ones which have been "turned out" because "the wheels of the meter index" go round too fast. Even the inventor of a new (?) close stove, which is said to reverse the laws of Nature, and give more heat than exists, is not likely to create a revolution. The days of miracles are now past.

The article in the "Lancet" for July 25 does not need much consideration. In the "Lancet" Commission report, it was stated that the combustion was *perfect*. Now the writer refers to "incomplete combustion," although it was perfect before. It claims that the new stove has "no drying effect upon the air." This is a point common to *all* flueless stoves. As regards duty, the only important point—the mean rise of temperature at the floor level—is carefully ignored, although its necessity is clearly pointed out by the great difference in thermometer readings at different levels showing bad circulation. It is stated that the stove in question is superior in efficiency to any tested by the "Lancet" Commission, although one—marked "P" in the series—gives the *total* heat in useful work! This curious result is obtained partly by ignoring the floor temperature, but principally by the extraordinary fact that the experimenter has taken the volume of air in the room as a measure of duty. If this were the case, the whole duty shown by the consumption of 17·8 cubic feet of gas in one hour is only that of the combustion of ¼ cubic foot of gas—*i.e.*, the raising of 3449 cubic feet of air a mean of 6¼° Fahr. At a normal 56° temperature and a 48° dew-point, the consumption of 1 cubic foot of gas will raise the temperature of 4920 cubic feet of air 10° Fahr.; showing, in the figures given, an efficiency (?) of about 3 per cent. and a loss of 97 per cent. of the total, if the figures show anything at all.

The writer ignores the well-known fact that almost the whole of the heat evolved is taken up in warming the walls and ceilings. This makes the comparison of two different-sized rooms impossible by the cubic contents plan; and it has in this case given rise to the fallacy that a stove can give out more heat than actually exists. If the experiments had been made on any definite basis, to enable the results to be checked by calculation, matters would appear in a very different light. It is, to say the least, amusing to compare the views of the "Lancet" Commission, as regards ventilation, radiant heat, &c., with those now adopted by the "Lancet." As regards sulphur compounds and their suitability for a conservatory with "delicate" (?) plants, it is well known that many apparently tender plants are practically proof against dilute sulphur compounds.

Warrington, Aug. 15, 1896. THOS. FLETCHER, F.C.S.

Low Rate of Interest and the Price of Commodities.

SIR,—Mr. John Green's statement, that prices during the last two years have "improved rather than otherwise," is not even "approximately correct." Mr. Sauerbeck's "Index Number" for 1890 was 72; for 1893, 68; for 1894, 63; for 1895, 62; for Jan., 1896, 61·4; for June, 1896, 59·3 (which was the lowest record for the century); and his figure for July is 59·2 (another record). When average prices are cutting the records month by month, it is inaccurate to say they are "improving rather than otherwise;" and surely Mr. Green might avoid "wearying a public meeting" without resorting to the use of "general terms" which are the reverse of facts.

Mr. Green appears to be curiously ignorant of the close connection between falling prices and the low rate of interest. He says: "Since our trade figures are, notwithstanding this fall, almost as large as the big year of 1890, it cannot have affected the value of money." I suppose that by "trade figures" Mr. Green means "volume of trade;" and by "value of money," he means "value of capital" or "rate of interest." If his very indefinite language does bear the meaning I put upon it, the statement is incorrect. If the volume of trade has remained the same as in 1890, and prices generally have fallen nearly 20 per cent. since 1890, it is clear that nearly 20 per cent. less capital is required to carry on the same volume of trade. Traders will have larger credit-balances or smaller debit-balances (as their case may be) at the banks. Thus more capital is thrown on the market to compete for investment, with the inevitable consequence of sending up the prices of all gilt-edged securities, and reducing the rate of interest. Here is a simple direct connection between falling prices and a low rate of interest, which even a monometallist might master, if he gave himself a chance. The indirect effect of falling prices—by stifling enterprise and so decreasing the demand for capital for the development of industries generally—has a much wider influence in depressing the rate of interest. There is probably no decade during which the wealth and capital of this country increased so rapidly as between 1855 and 1865. Yet during that time 5 per cent. was considered a low rate of interest, and from 6 to 8 per cent. was not unusual. Professor Jevons (who, by the way, was a monometallist) says the high rate of interest was due to the greatly extended field for the profitable employment of capital, which he attributed mainly to the gradual rise in the prices of commodities, which followed the gold discoveries made in California and Australia.

If Mr. Green were not so blinded by his zeal to discover some "veiled bimetallist," he would probably find in falling prices a far more satisfactory explanation of the low rate of interest than his suggestion that the British investor is tired of 2 per cent. My opinion is that the investor is sick of 2 per cent., but cannot help himself. Substantial men, who can show good security, will not borrow his capital because they cannot see a chance of using it profitably in business. The root of the whole matter is the unprofitable state of our staple industries—agriculture, coal, iron, and cotton, and the legion of smaller ones depending upon them. Get these into a profitable state, and the accumulations of capital on the market will vanish like smoke, and the rate of interest will quickly rise.

Manchester, Aug. 14, 1896. DAVID SPENCE.

The Water Companies and Household Storage.

SIR,—The heading of this letter is a subject which is now attracting attention on lines very different to those on which it came before the public, some twelve years ago, during the Health Exhibition of 1884; and I trust you will give me an opportunity of pointing out how the great question of "The Water Companies and Household Storage" has undergone this remarkable change, and where a great share of the blame for the water famine in the East of London should lie.

In 1884, if there was one sanitary requirement more constantly advanced, and on which more weight was laid, than another, it was that the water supply system known as the "intermittent," with household storage in cisterns, should cease, and the "constant" supply should be universal, and all cisterns be done away with, except the minimum necessary for sanitary purposes. To such an extent was this sanitary principle carried, that at the Health Exhibition of 1884, with the one exception of the cistern which I exhibited, and for which I was awarded a silver medal, not a single attempt was made to exhibit in any way a scientific or practical mode of dealing with the question of storage of water for other than sanitary purposes. There were those who pointed out the risks to health incurred by an unconditional acceptance of the principle of the "constant" supply, but all to no purpose. The sanitary authorities of the day had set up a "fetish" in the form of this constant supply, together with the removal of all attempts at household storage of water, except for sanitary purposes; and many an outbreak of disease has doubtless been due to the clandestine withdrawal of water for drinking purposes from cisterns designed and placed solely for sanitary purposes, and often in an unutterable condition of insanitation, owing to the temporary cessation in the "constant" supply necessary for the repairs of the pipes in some houses in the street for instance.

Here I am not writing without knowledge of the subject. I could give particulars of a large establishment in South London, employing many hands, in which the water supply arrangements were up to the then date, and all drinking water was drawn direct from the main. On one occasion, owing to a serious burst in one of the largest pipes, the water was wholly turned off for a considerable period; and I know that during the whole of the time the water for drinking purposes was drawn entirely from the storage for sanitary requirements! Who shall tell how many cases of sickness arose from this cause, which were doubtless quite inexplicable as to their origin, but which are fully accounted for when the state of those cisterns, "put anywhere, as they were only for sanitary purposes," are considered.

Far be it from me to say that there are no risks of danger to health both in the condition and locality of many cisterns; but surely that is no reason why a practical necessity, and one carried out in Nature, is to be abandoned. No; let there be with any system of water supply a scientific, and I may add, a natural system of water storage for drinking purposes, however constant or pure the water supply may be. But cisterns with edges pointing inwards, and thus affording no means of escape for animals, especially blackbeetles, which often fall into the water, if anywhere near the hot supply, and decompose in it, are to be avoided. Another form should be adopted, or a mode of admitting the water if not more scientific, at least more natural, than that of pouring it in from the top, keeping, in the case of a constant supply, a condition unknown in Nature, under similar circumstances—viz., of constant unrest instead of rest in a *tranquil bed* where the deposit may rest and not be perpetually in the "constant" and periodically in the "intermittent" disturbed.

I will gladly hereafter allude more in detail to what I believe to be an absolute necessity of health—viz., a cistern or cisterns scientifically constructed and placed, containing a storage of water for drinking purposes, in proportion to the requirements of the household or establishment, sufficient to tide over that oft-recurring condition—viz., intermissions in the constant supply owing to various causes. In the meantime, let those bear the burden of the blame of the present water famine in East London whose persistent attacks on cisterns led the too ready houseowners of a certain class of property to either take them away, or allow them to fall into disuse, thus with the approval of the sanitary authorities getting rid of what often proves, with leaking ball-cocks, &c., a source of constant if not excessive expense.

ROBERT PRINGLE, M.D.,
Blackheath, Aug. 12, 1896. Brig. Surgeon, Lieut.-Colonel.

Electric Lighting at Newport (Mon.).—At the last meeting of the Newport (Mon.) County Council, Mr. G. H. Llewellyn, the Chairman of the Electricity Committee, brought up their report, which showed a profit of £180 for the year ending March 25.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Tuesday, Aug. 11.

DUBLIN CORPORATION BILL.

On the order for the consideration of the Commons' amendments to this Bill,

The Earl of MORLEY (Chairman of Committees) said this was a Gas and Water Bill when it was originally introduced into the House of Lords. The Lord's Committee threw out the gas clauses; and when the Bill went to the Commons, it was purely a Water Bill. In the Commons the Committee were instructed to deal with the municipal franchise of Dublin; and clauses were introduced into the Bill for this purpose. It was obvious that these clauses could not be covered by the original notices; and when the Bill as amended came before the Examiners, they found that there had been non-compliance with the Standing Orders. The Standing Orders Committee had met that afternoon, and had heard the promoters and certain of the opponents of the Bill; and they had come to the conclusion that the Standing Orders should not be dispensed with, and that the third part of the Bill, relating to the municipal franchise, should be struck out. Moreover, there was opposition to dispensing with the Standing Orders; and further, as the Bill originated in the House of Lords, and these amendments, which were never contemplated in the first instance, were introduced in the House of Commons, it would now be impossible for anyone who wished to oppose to be heard in the House of Lords. He hoped the House would agree with the decision of the Standing Orders Committee; and he wished to lay emphasis on the great importance of keeping matters dealing with public interests, such as the municipal franchise, out of Private Bills altogether. Further, it had an extremely prejudicial effect on private legislation that it should be possible in a Gas and Water Bill to introduce matters which were not cognate to the subject of the Bill. Therefore he asked their lordships to agree to the report of the Standing Orders Committee which he now presented to the House.

The motion was agreed to.

The Earl of MORLEY moved that the House do disagree with those portions of the Commons' amendments which dealt with the franchise clauses of the Bill, and that the House do agree with the rest of the Commons' amendments.

This was agreed to.

Friday, Aug. 14.

To-day the Royal Assent was given to the Barry Urban District Council Bill, Bilston Improvement Bill, and Staines Reservoirs Bill.

HOUSE OF COMMONS.

Thursday, Aug. 13.

DUBLIN CORPORATION BILL.

To-day a motion was made to suspend the Standing Orders to allow of the consideration of the Lords' reasons for disagreeing with certain amendments made by the Commons in the above-named Bill. An amendment was moved to defer the matter for three months; and this was agreed to by a majority of three—65 to 62. The Bill was therefore lost.

LEGAL INTELLIGENCE.

Poor-Rate Assessments and Water-Rates.

An important point as regards a Water Company's right to increase their rates between two quinquennial assessments came last Saturday before the Registrar of the Mayor's Court—Mr. F. S. Jackson—to whose arbitration it had been referred. The parties were the East London Water Company and Mr. Brown, the owner of considerable property in the East-end of London. The defendant has in Bethnal Green some houses which in 1891 were, in the aggregate, assessed to the poor at £92. By Torrens's Act, Water Companies in the Metropolis are bound by the poor-rate assessment; but in October, 1895, the parochial authorities provisionally assessed the defendant's house at £112—an increase of £20. The provisional assessment was confirmed in April, 1896; and the question to be decided was whether the Company were entitled to charge their increased assessment of £112 as from October, 1895, or only from the time of the confirmation in April, 1896. It was admitted that the case was of great importance, as the assessment of a considerable portion of the Metropolis had been provisionally increased between the several quinquennial assessments. The Vestry Clerk of Bethnal Green was called to prove that the assessment of the property was provisionally increased in October, 1895, and that the defendant had paid poor-rates on that assessment without demur. Mr. Carnegie, for the defendant, contended that the latter circumstance should not prejudice his client; and in support of his contention, he quoted the Company's demand-note for rates, which stated that where the assessment had been altered owing to the quinquennial valuation, the rate to Lady-day was passed on the old assessment. Mr. George Kebbell, on behalf of the Company, replied that, read strictly, this statement was quite reconcilable with the Company's contention; but, further than that, the making of the demand was quite optional on the part of the Company. The Registrar said the wording of the demand was a little unfortunate; but he could not go the length of saying that the demand-note in question constituted a contract. Looking at all the circumstances, and particularly at the fact that the defendant had paid his poor-rate upon the new assessment without appeal, he should give his award for the Company, with costs.

MISCELLANEOUS NEWS.

SOUTH METROPOLITAN GAS COMPANY.

The Ordinary Half-Yearly General Meeting of this Company was held last Wednesday, at the Bridge House Hotel, London Bridge—Mr. GEORGE LIVESEY in the chair.

The SECRETARY (Mr. Frank Bush) read the notice convening the meeting, and the minutes of the last meeting. The report of the Directors, with the accounts for the six months ending June 30—given in the "JOURNAL" for the 4th inst.—was taken as read.

The CHAIRMAN, in moving the adoption of the report and accounts, said it was sometimes rather difficult to find a subject for a speech; but seeing how largely the meeting was attended, he was sure that great interest was still felt in the Company. One, however, would be almost glad sometimes if one could have a friendly critic, by which he meant a man who was interested in the welfare of the Company, and who would endeavour to point out weak spots or points in it, in connection with which an alteration or improvement might be made. He would almost rather have a critic who was a little bit waspish than not have one at all. He desired to say that he did not here refer to their friend Mr. Harris, who criticized them at their last meeting, as "waspish." He would rather call that gentleman a busy bee, who endeavoured to get all the honey he could for himself, and to prevent others from getting more than their share. He would, however, suppose that such a critic as he had mentioned was present, and that he raised questions regarding the Company's affairs. He thought such a critic might bring forward the question of the increase in the capital, and also the question of the great development of the Company's business in the shape of the automatic or penny-in-the-slot meters—as to whether they were conducting this business in a profitable manner. The critic might also draw attention to the large amount they now paid under the profit-sharing arrangement with their employees—the amount so paid in the past year having been upwards of £17,000. The critic might also question them somewhat in connection with the price of their products, and ask why they reduced the price of their gas last year knowing that products were in such a bad way. He (the Chairman) would endeavour to answer some of these questions, assuming that they had been put. He would at once admit that their capital had increased in the last four years at a very great rate—by nearly £500,000. They had spent during the last four years £476,000 on capital account. This was an account which required very careful watching, because it was very easy to charge items to capital which ought to be debited to revenue. He thought, however, that the Directors were very careful in regard to this question, particularly Mr. Rostron, who was one of their oldest and most useful members, and who was always keeping watch against increases of capital. But how had the money been spent? Of the £476,000 which, as he had said, had been laid out during the last four years, £133,000 had gone on extensions of works, £97,000 on mains and services—in distribution—£133,000 in meters, and £114,000 on stoves. In fact, 28 per cent. of the total expenditure had gone to works or manufacturing plant, and 72 per cent. for the purposes of distribution. He might say that the 28 per cent. did not nearly represent the increased capacity they had obtained in their works. The Engineer had been working very assiduously lately in increasing their gas-making power, which had advanced at a much greater ratio than the expenditure of capital on the extension of the works and manufacturing plant. But here was this startling fact—that £344,000 had been spent in distribution during four years. Of this amount, £156,000 had been laid out on penny-in-the-slot meters and gas-stoves connected with them; and in addition to that, nearly £100,000 had been expended in fitting up working men's houses—this amount being in course of liquidation. The shareholders would ask him what had been the result of this enormous amount of capital expenditure. He might inform them that the increased capital charge, in the four years from June, 1892, to June, 1896, was just £19,000 a year; and the rate of interest at which they had raised the capital had been a little over 4 per cent. They had raised £456,000 and had spent £476,000; the difference being what they had received on selling land. For this expenditure, however, they had a very considerable increase of ordinary and prepayment business to show; the increase in the past half year being 732 million feet compared with four years ago, or 22 per cent. Therefore, capital had increased 14 per cent., and interest had increased 6 per cent.; but the business had increased 22½ per cent.—that was to say, their profit had increased three times as fast as their expenditure to earn that profit. He thought that this was the real answer to the question: What has been done with the capital?—that the increased business had brought in an amount of profit which would more than three times pay the additional interest on the capital. The surplus profit had enabled them to reduce their price. With reference to the prepayment meters, it was a very large venture, and had very far exceeded their expectations. When they started on the business, they thought there might be a few thousand workpeople who would adopt this system of lighting. They were very much astonished when they heard, hardly four years ago, that the Liverpool United Gaslight Company had 7000 or 8000 of these consumers; and they thought then that 8000 was an extraordinary number. They had no idea that in four years the number of these small consumers in their own case would exceed 50,000. To supply these consumers had involved an outlay, as he had said, of £156,000 on meters and stoves, and nearly £100,000 more for fitting up their houses. The meters and stoves were charged to capital; but the fitting up of the houses they did not think it was right to charge to capital, because it would be a very precarious asset if any disaster happened. The fittings cost them about 35s. per house; but if from any cause they should be thrown on the Company's hands, they would not be worth the trouble of removing, and so they did not think that they should be treated as a permanent asset and debited to capital. They therefore charged a large portion of the expenditure straight away to the revenue; and in the accounts now

submitted, an entry would be noticed in the revenue account, under the heading of distribution, of "gas-fittings (labour), £3563." On the other side of the accounts, on the last line but one in the balance-sheet, they would see the entry "balance due for automatic gas-fittings, £34,877." This was an amount in process of liquidation or collection. Every half year—in fact, every month—something was paid off each account. They charged these small consumers no meter, stove, or fittings rent; it was all included in the price of the gas. They gave 27 cubic feet for a penny, which worked out at something more than the price they charged to their ordinary consumers; and this addition paid for interest on the capital outlay, for depreciation, for maintenance, for the extra cost of collecting, and also went towards the redemption of the money spent in fitting up the houses. Shortly, he might say that this £34,877 was a balance. It was being added to—last half year by £10,000; but £6000 was paid off. It was £30,000 at December; and it was £34,000 odd in June. They had received £6000 in payment for the houses already fitted up; and they had spent nearly £10,000 on new ones. The time would shortly come when the receipts would balance the outlay; and a little while after that, when nearly all these people had got supplied with gas, the receipts would exceed the half-yearly outlay, and this item of £34,000 odd would gradually disappear, when they would have all this extra business for the comparatively small outlay of capital involved by the meters and stoves. The system was going on as satisfactorily as ever. He heard accounts from independent quarters that it was giving great satisfaction to the working classes; and the orders were still coming in, although not quite so fast as they did last year. When, however, they remembered that they had supplied already half of the small householders in their district, it could not be expected that the demand would go on at the same rate as before. He might mention one rather amusing incident in connection with the automatic supply, although it was a digression. A man having one of these meters thought he would make a savings-box of it; and instead of putting in pennies for his gas, he put in two-shilling pieces. Presently he wanted his savings out; and he therefore sent for the collector, and asked for the return of his money. The collector opened the box, and found that it contained two-shilling pieces instead of pennies; and after referring to the index, and finding how much gas the man had used, he handed over to him the difference. The satisfactory part of the incident was that the man had confidence in the Company, and felt that he was dealing with people who would treat him honestly. He thought he might say to any critic of the automatic system, that they had found it was an advantage to the Company; and he was sure that it was a great boon to working-class people. With respect to the profit-sharing system, he might be asked what they got for this. He would say that they were a commercial body, not philanthropists, and working on business lines. They started this system seven years ago, for the purpose of attaching their workpeople to them. Some doubt was entertained at the outset as to whether it would have this effect; and he might state now, after seven years' experience, that it had had the effect they had anticipated. He was sure that, on the part of the large body of their employees, the system had created a feeling of interest in the Company and of *esprit de corps* which was new. He did not say that this remark applied to all their people, because there were some persons who were never interested in anything. It ensured them, moreover, against anything in the nature of a strike; there was no fear whatever of any further trouble with their employees. The system had rendered them perfectly free to deal with their workpeople, as between man and man, without the interference of any outsider whatever. It had furthermore encouraged thrift on the part of their people, something over £70,000 of whose money had accumulated in the Company's hands in the past seven years. He thought this was tolerably good evidence that, when the opportunity of thrift was given to workpeople, they would avail themselves of it. More than half this sum was invested in the Company's stocks. Their critic might next ask: What about your products? Well, he regretted to say that this was the worst feature of the accounts. Coke and sulphate of ammonia were never so low as at the present moment. Enormous stocks of coke had been allowed to accumulate in London, though not by themselves; but he hoped that measures had been taken to get rid of these stocks, on the removal of which one might look for an improvement, after a time, in the price of coke. They had received less for their coke per ton of coal than ever before; and the same might be said of sulphate of ammonia. The encouraging point, however, was that, notwithstanding these low prices, they had been able to make both ends meet, and a little more. He must confess that he had looked forward with considerable trepidation to the result of the past half-year's working. He had expected to find a deficiency—that they would not have enough to pay their dividend. But by a concourse of circumstances, including the good working of their people, their earnest efforts to do their best, and the increase of their business, they had earned an amount of profit sufficient to enable the Directors to recommend the same dividend as that paid last time, and to carry a little over. This was their justification for having reduced their price. They had thought they might be able to come through fairly; and although the price of coke had gone down lower than they had expected, and they had been in some doubt during the half year, still they now thought they saw their way to maintain the price at its present low figure, and to go on without a deficit in the future. He thought the only other point on which it was necessary for him to say anything was their new Act of Parliament. He remembered reading in one of Stanley's books: "What is won is done; the joy lies in the doing." Well, the thing was done; and, so far as he could see, there was very little now to be said about it. They all knew pretty well that the object sought for was to convert their capital—their "A," "B," and "C" stocks—into one uniform stock, and thus to give them perfect unity as a body of proprietors. He believed this was a thing worth doing; and certainly from their experience in connection with this matter, they had seen that there was a danger of disunion among the various shareholders. Their interests had not been precisely identical; but henceforth they would be, and there would be no difference whatever. They had also thought that, having to sell their new capital by auction, and getting only the market rate of interest—4 or 5 per cent., as it might be—it was very unfair to be gibbeted with paying a so-called "bloated" dividend of 13 per cent., while the real dividend paid on all capital raised since 1876 had simply been about 4 or 5 per cent. He hoped that the result of the conversion would be beneficial to the Company—at any rate, the "A," "B," and "C" stocks from that day disappeared. The old South Metropolitan Company, the Phœnix Company, the Surrey Consumers' Company, and the Woolwich Companies had all gone; and they were now the new South Metropolitan Company, with one large stock, bearing a uniform rate of interest of 4 per cent., which if they paid their present dividend, would be equal to £5 4s. per cent. on the new stock. They had had some trouble about the Bill. They presented it last year; and in consequence of the opposition of the London County Council, the Bill was defeated. They had not, however, felt disposed to give it up, holding that it was a proper thing to do; and with the proprietors' approval—he might say, their hearty assent—they presented another Bill this session. They were again opposed by the London County Council—or, rather, a section of that body, because some of the members approved of the measure. One leading member, certainly, in speaking of the Bill in a debate, said he considered it the best Bill that had ever been promoted in the interests of both employees and consumers. The Progressive section of the Council endeavoured twice to get a majority to warrant their opposing the Bill; but they failed on both occasions. They found however, that the Directors had put in the Bill one little clause as to the purchase of two small pieces of land which the Council had acquired from them for the Blackwall Tunnel approaches. The Council did not want this land, but the Company did. They asked the Council to re-sell it to them; but they declined to do so. A clause to acquire the land in question was therefore put in the Bill; and this proceeding had given the Progressive party *locus standi* without going to the Council for a majority. They therefore opposed the Bill, and did all they could to prevent it passing. One leading member of the Progressives told him: "I will do everything I can to oppose you. I do not approve of consumers and workmen becoming shareholders." They did not succeed in their opposition to the extent they desired; but they did raise the question before the Committee. The Company, however, had got the conversion and all the main things; but they had been prevented from getting the direct power of offering their stock to the consumers. All sorts of objections were brought forward by the Council; and the Committee thought that what the Company desired to do would have created a dangerous precedent, although it would really have been a very useful one, for he was convinced that it would be a beneficial thing for Companies like theirs to give facilities to small investors to put their savings into their stocks. However, the County Council frightened the Committee, who struck this clause out. But the Company would do as they had done before in this matter. They had managed to offer their stock to their consumers before; and they would do so again. He might state that the Board of Trade and the House of Lords had been with the Company in this matter; but the County Council alarmed the Committee. On the previous day, he received a letter from a consumer, who held a small amount of stock in the Company, and who had asked him a question, to which he had replied by letter. This consumer, however, wrote: "I am one of those who have been permitted to come into the Company through being a consumer of its gas; and if you would allow me, I should like to thank you for having extended to me and so many others this privilege. My little investment of my savings has proved to be exceedingly fortunate." Testimonials of this kind were very gratifying, and showed that giving people an opportunity of investing their savings in this way was an advantageous thing for them. There was another part of their Bill on which they had been defeated; there was a knotty point in it about workmen-directors. These clauses had now been passed, however, and the fact that they were in the Bill created a strong sympathy in their favour on the part of leading men on both sides of the House of Commons and the House of Lords. The Directors had put the qualification for a workman-director at £100. But the Committee, without any reason, took it into their heads to alter this to £350. The Directors pointed out that this was an impossible figure for a workman to save. But the Committee replied that they had fixed the amount, and they would not listen to any alteration. There remained the House of Lords; and he must say that prominent members of that House behaved in the kindest and most sympathetic way in this matter, and were quite prepared to amend the clause. Mr. Bush and he (Mr. Livesey) had interviews with them. They went so far as to ask the Chairman of the Committee whether, if the House of Lords restored the original qualification, he would allow it to pass in the House of Commons without protest; and he replied in the negative. He then said it was not a question for them to run any risk about, and that they would take the Bill as it was offered to them. If, however, in the course of a year or two, they found it necessary—as he believed it would be—to get this absurd qualification altered, they must ask the shareholders for their consent to make the effort. It would not cost much, and they would then put matters on a proper footing. He had only, in conclusion, to congratulate the shareholders on the passing of the Bill as it was, and to say that the Company were going on doing their duty to the public; and so long as they served the public interests, he had no fear at all but that their prosperity would be maintained.

Mr. J. MEWS seconded the motion.

Mr. E. T. E. BESLEY, Q.C., said he did not think there would be any hostile critic of the Directors' proceedings; and he thought the shareholders had much reason to congratulate themselves in having a Chairman who had proved himself capable of carrying through Parliament such a Bill as that in question. With reference to the subject of workmen-directors, the advantage of the scrutiny of the Board's proceedings by one such Director seemed to him to be about *nil;* and the workmen, by putting their money in the Company's hands, had shown the confidence they felt in the Chairman and the Directors. While Mr. Livesey was Chairman, he believed that no one would want any better representative. The 12th of August was conversion day. The "A," "B," and "C" stocks would disappear, and be fused into one stock having equal advantages. From the 30th of June to the 12th of August, however, the earnings of the Company had been on the divided capital,

and he thought it would be desirable, if possible, when preparing the accounts for next half year, to state what the earnings had been up to the 12th of August, and to let their dividend resolution be in accordance with the fact that the conversion did not take effect until that date. The penny-in-the-slot meters had been a great success, and in the case of their Company it had been most marked. He congratulated the Directors on the results of the half-year's working, and on their success in Parliament.

Mr. JEFFRIES called attention to the small advantage obtained by the Company from their breeze. He also asked a question about their investments. He gave place to no one in his desire to benefit the working classes, and he did not object to the principle of workman-directors; but there were some considerations which it behoved them as shareholders, and also the Directors, to consider.

The CHAIRMAN pointed out that this was a question which did not affect the shareholders at all, at the present moment; it had been thoroughly discussed at previous meetings. Before, however, anything further could be done, the matter would be submitted to the proprietors for their approval.

A SHAREHOLDER said he was a holder of "B" stock, and a friend of his had told him that he would lose by the conversion. He should like to know if this was so?

The CHAIRMAN replied that the "B" proprietors would gain slightly by the change.

A SHAREHOLDER: Shall we all require to have new certificates?

The CHAIRMAN: Yes. In further reply, he thanked Mr. Besley for his remarks and suggestions. The question of dividing up to the 12th of August was impossible; and if it were possible, it would not be worth doing, because they expected to pay the same relative dividend next half year as for the past half year. They had so divided the stock that each stockholder would get practically the same dividend on his new stock as he got on his old. The only difference was that the "B's" would get a little more—instead of £12, the amount would be £12 1s. 6d. It was not worth talking about. They could not help making breeze; and they had to sell it for what they could get. When brick-making was active in the immediate neighbourhood of London, they could sell their breeze well. Breeze, however, was coming more into use as fuel, in connection with the furnaces constructed for burning dust fuel. There was an increased demand for it at the present time; and they were getting a little better price. They sold their breeze during the past half year for £5300; and deducting the cost of labour, there was a net gain of £2865 on this product. With reference to Mr. Jeffries' question about investments, their rule was to invest their reserve fund in securities of the highest class, giving them not quite 3 per cent. It so happened that there was £18,000 not invested at the present moment; but it was only awaiting investment. Their other funds were invested nearly up to the hilt. With regard to the workmen's bonus and savings deposited with the Company, these savings were withdrawable at a week's notice; and they were really acting as a savings bank for their workmen. He therefore thought they had invested quite as much as they ought to.

The motion was then carried unanimously.

The DEPUTY-CHAIRMAN (Captain Thomas B. Heathorn, R.A.) then proposed the following resolution: "That a dividend at the rate of 13 per cent. per annum be now declared, and that such dividend be apportioned amongst the three classes of stock as prescribed by the Scheme of Amalgamation, 1880; and that the warrants be transmitted to the registered addresses of the proprietors by post." This was, he observed, a pleasant announcement. It was the last dividend the old South Metropolitan Company would ever pay; but he had no doubt that the new Company would give them just as much, and possibly a little more.

Mr. SIMPSON ROSTRON, in seconding the motion, remarked that it was not only the last dividend of the old South Metropolitan Company, but the largest.

The CHAIRMAN stated that the "A" stock would get the dividend to which it was entitled—£15 14s. per cent.—part of which it had hitherto foregone; the "B" stock would get 12 per cent.; and the "C" stock, 13 per cent.

The motion was carried unanimously.

The CHAIRMAN afterwards proposed a resolution in effect authorizing the Directors to sell the wharf and land and the works thereon known as Ordnance Wharf, at East Greenwich.

Mr. J. EWART seconded the motion, which was carried.

Mr. HARRIS then proposed a vote of thanks to the Chairman and Directors. After alluding to the Chairman's reference to him, he stated that he had opposed the scheme of conversion because he had thought that the holders of the "A" stock were getting too much advantage; and he held that this view was justified by the present quotation of the "A" and "B" stocks.

Mr. STOCK seconded the motion, and commended the Directors for the indomitable energy they showed in connection with the Bill.

Mr. FOSTER supported the resolution; and observed that he did not look at the market price of the stock, which was a matter that varied from day to day. What he studied was the amount of the dividend. He had held his stock for about fifty years; and he did not intend to sell it—at all events, not just yet. He thought they ought to express their heartiest thanks to Mr. Livesey for the Bill.

The CHAIRMAN: And to the Directors.

The resolution was carried unanimously.

The CHAIRMAN, in acknowledging the vote, said he did not think it would be wise or necessary to answer Mr. Harris, only that he would be sorry for any shareholder to leave the meeting with a feeling of dissatisfaction at what had been done. The Directors were perfectly certain that, except on the terms settled, no fusion of interests was possible. A few "A" stockholders considered they ought to have had a little more, and so did a few "B's." They endeavoured to deal fair-handed justice to all classes. The Stock Exchange was not infallible; and he maintained that it had always been wrong regarding the "A" stock, which ought all along to have stood at a higher relative price in the market than the "B" stock. Up to the last few months, however, the "A" stock stood at a lower relative price on the Stock Exchange. Since the "A" and "B" stocks were created, 16 years ago, he had received many letters asking him whether he advised the writers to invest in gas stock; and he had always replied that he gave no advice at all as to investments. But the question had more often been put to him in this shape: "I wish to invest in your Company. Which stock do you recommend—'A' or 'B'?" He had always recommended the "A" stock; and he had been right It had paid better all through, at the price at which it had been bought, than the "B" stock; and the Stock Exchange had at last learnt that the "A" stock was as good as the "B." He would tell them why. The "A" stock had stood to gain 11s. 9d. per cent. for every penny reduction in the price of their gas; and the probabilities of a reduction of price were far greater than of an increase. The progress of gas in price had been downwards; and the dividend had gone up. However, he was very glad to feel that the whole thing was now settled. He could assure Mr. Harris that no one was more anxious than the Directors to see the reserve fund built up; and in the last four years it had increased from £37,000 to £92,000. He hoped next December it would top £100,000; and if they could increase it to £150,000, he thought this would be sufficient for their purposes. He afterwards warmly testified to the services of the Engineer and the Secretary, and those who served under these gentlemen, to whom he proposed a vote of thanks. He had already told them that the capacities of their different works had been largely increased at a very small expenditure of capital; and he might say that the various works of the Company were never in so good a condition as they were at the present moment, and were never so largely in excess of all probable demands in the immediate future. Mr. Bush had rendered them invaluable assistance in connection with their Bill, and had performed his duties to their complete satisfaction. They were also indebted to the other officers, who took great interest in their work.

Mr. BROWN seconded the motion, which was carried unanimously.

The CHIEF ENGINEER (Mr. Frank Livesey) remarked that the Chairman had taken out of his mouth what he had intended to say in reply to the vote. There seemed every probability of a large consumption of gas in the coming winter; and he thought he could safely say that they were fully prepared to meet any demand that might come on them at all their works.

The SECRETARY also acknowledged the vote, and stated, in regard to the conversion of the stock, that a circular would be sent on the following Saturday to every shareholder, intimating to him his present holding, and what his holding would be under the new arrangement. The circular would show in nearly all cases that a fraction of stock would have to be bought or sold. A transfer would be sent to each shareholder, so that he could buy the fraction which he required; and the price had been fixed at 140. He would esteem it a personal favour if the certificates were sent in as quickly as possible.

The proceedings then terminated.

SHEFFIELD UNITED GAS COMPANY.

The Half-Yearly Report and Accounts.

The accounts which the Directors of the above-named Company will present to the shareholders at their meeting on the 15th prox. show that, including the balance brought forward (£7759), a sum of £42,220 stands to the credit of the profit and loss account. After payment of the usual dividend, amounting to £38,263, there will remain a balance of £3957 to be carried forward. In the six months ending June 30, the capital expended on the works and plant was increased by £3651; bringing the total up to £740,521, and leaving a balance of £55,849. The sale of gas produced £95,387; the rental of meters, £5506; residuals yielded £32,878; and the total revenue was £134,657. The manufacture of gas cost £76,874, whereof £37,774 was for raw material and the incidental expenses attending its conveyance into the works, £12,849 was for carbonizing wages, and £22,306 was laid out for the repair and maintenance of works and plant; distribution cost £9416; rents, rates, and taxes amounted to £8991; management expenses, to £4922; and the total outlay on revenue account was £100,893—leaving £33,764 to go to the profit and loss account. The quantity of coal and cannel carbonized in the six months was 95,738 tons; the estimated quantities of residuals being: Coke and breeze, 57,467 tons; tar, 6404 tons; ammoniacal liquor, 3,027,000 gallons.

In their report, the Directors remark that the sale of gas in the past half year exceeded that of the corresponding period of 1895 by 3,336,000 cubic feet, although, owing to the exceptionally severe weather, there was an increase to the extent of 11 per cent. in the consumption in the first three months of that year. The income, however, shows a decrease of £3940, due to the reduction in price last April of 2d. per 1000 cubic feet. The Directors allude to the considerable falling off in the receipts for sulphate of ammonia, the market for which has been, and still remains, extremely weak. Reference is made to the death of Mr. W. Wake, who served the Company as Law Clerk during the long period of 52 years; and the Directors testify to his foresight and energy contributing largely to establish the sound position which the undertaking now occupies. Mr. Hanbury Thomas, the Company's General Manager, has been appointed Secretary in succession to Mr. Wake.

CRYSTAL PALACE DISTRICT GAS COMPANY.

The Half-Yearly Report and Accounts.

In the report to be presented to the shareholders of the above-named Company at their meeting next Friday, the Directors record a reduction of income to the extent of £6964, and of expenditure to the amount of £4724. The gas sold in the six months covered by the report—January to June—was about 3 per cent. less than in the corresponding period of 1895; but, considering that in that year there was, in consequence of the exceptional winter, an increase of 15 per cent., it is very satisfactory, in such a mild winter as the last, to so nearly approach these high figures. Moreover, the decrease was in

the March quarter only. Since then the vitality of the Company's business has been proved by large increases week by week, due to a great extent to the adoption of gas for lighting and cooking by the working classes. The number of automatic prepayment meters in use on the 30th of June last was 4199—an increase of 1053 in the half year. The Directors remark that this rate of growth gives promise of being fully maintained until the small householders in the Company's district generally are supplied with gas. The diminished income above alluded to is due to the decrease in the gas sold, to the reduction in the price of gas that was made at Midsummer, 1895, and to the very low prices—the lowest ever known—of coke and ammonia. The reduced expenditure is mainly in coals and repairs of works. The net result is an amount of profit about £2400 short of the sum required to pay the interest on debenture stock and a dividend equal to that of the last half year. The Directors recommend that dividends, less income-tax, be paid at the following rates per annum—viz., 5 per cent. on the preference stock, and 5¼ per cent. on the ordinary stock. The deficiency will be taken from the undivided balance, leaving £1633 to carry forward. In addition to this balance, there is the ample reserve fund of £40,521.

The accounts accompanying the report show that £1632 was spent in the past half year for capital purposes—mainly for manufacturing and distributing plant. The total expenditure was brought up to £647,764; leaving an unexpended balance of £14,629. The total gas rental was £60,304; the meter and stove rental, £2030; the revenue from residual products, £15,357; and the total receipts, £77,719. The principal items of expenditure were: Manufacture of gas, £48,249 (coals and carburine costing £31,425); distribution of gas, £6086; management, £2845; profit-sharing, £1203; rents, rates, and taxes, £2625—the total expenditure being £62,948, and the balance carried forward, £14,771. The works, under the supervision of Mr. Charles Gandon, M.Inst.C.E., carbonized 47,241 tons of common coal and 1124 tons of cannel, and consumed 32,645 gallons of carburine, in the manufacture of gas, of which 489,251,000 cubic feet were made, and 468,989,000 cubic feet accounted for. The residuals produced are stated in the accounts as follows: Coke, 580,375 cwt.; breeze, 6736 yards; tar, 483,646 gallons; and ammoniacal liquor, 8956 butts of 108 gallons. There were 405 tons of sulphate of ammonia made, and 75 tons in store; and of the entire quantity, 462 tons were sold.

TOTTENHAM AND EDMONTON GAS COMPANY.

The Half-Yearly Report and Accounts.

In the report to be presented at the half-yearly general meeting of this Company on the 29th inst., the Directors remark that, comparing the quantity of gas sold in the six months ending June 30 last with the corresponding period of 1895, the increase shown is 3·96 per cent., against an increase in the June half of 1895 over the corresponding half of 1894, of 10·57 per cent. The mildness of the past winter tended to reduce the consumption; and an apparent decrease is caused by the decision of the Directors to have the reading of indices of the meters recorded within the respective quarters. The number of consumers supplied by ordinary meters on the 30th June was 5764, and the number of automatic meters in use at the same date was 3387, as compared with the June half of 1895. This shows an increase of 275 ordinary and 1837 automatic meters. The demand for the supply of gas, both for lighting and cooking purposes, by the automatic meter system continues steadily to increase. The number of gas cooking-stoves fixed and on rent is 1293. Comparing this with the June half of 1895, an increase of 425 is shown. New purifiers are in course of construction; and the carburetted water-gas plant has been duplicated. These important additions, and several other minor extensions, will be completed early in the coming autumn. The Engineer (Mr. W. H. H. Broadberry) reports the works, machinery, and plant to be in excellent condition. The profit and loss account shows an undivided amount on Dec. 31 last of £1996. The balance of net profit is £7456, to which has been added £192 taken from the reserve fund; making a total of £7648, which enables the Directors to recommend the payment of the following dividends, less income-tax: On the "A" stock at the rate of 11½ per cent. per annum; and on the "B" and "C" stocks, at the rate of 8½ per cent. per annum.

The sale of 160,796,500 cubic feet of gas to private consumers, and 21,239,800 cubic feet for public lighting—together, 182,036,300 cubic feet—produced £26,783; the rental of meters, stoves, and fittings, £1404; residuals, £2825; and the total receipts were £31,053. The expenditure on the manufacture of gas was £17,007 (coals costing £11,309); on distribution, £3199; rents, rates, and taxes came to £1708; management cost £1752; and the total outlay on revenue account was £24,693—leaving £6360 to go to the profit and loss account. There were 8442 tons of coal carbonized, 1769 tons of coke used in the manufacture of carburetted water gas, and 342,850 gallons of petroleum employed for enrichment purposes. The residuals produced were: Coke, 5305 tons, of which 3773 tons were used; breeze, 1017¼ chaldrons, 716 chaldrons of which were used; and tar, 111,133 gallons, all of which was sold. There were 914 butts of ammoniacal liquor in store on Dec. 31 last, and 2456 butts were produced. Of the bulk available, 3103 butts were worked up. With the sulphate of ammonia in store and the quantity made, there were 149 tons 16 cwt. for disposal; and of these 139 tons 16 cwt. were sold.

Scarcity of Water at Heywood.—The East-end of London is not by any means the only district suffering from a restricted supply of water owing to the drought. At the meeting of the Heywood Town Council last Thursday, it was reported that the water supply had become so low that a most critical stage had been reached. A supply of a million gallons of compensation water each day to riparian owners would have to be stopped; and if this were done, the Council would incur a penalty of £50 a day. There was no alternative, as the principal reservoir was empty, and the others were very low.

PROVINCIAL GAS AND WATER COMPANIES.

Gas Companies.

The Ascot District Gas Company held their ordinary meeting on Monday last week, under the presidency of Mr. R. Berridge, the Chairman of the Company. The statement of accounts showed a profit of £713; and the addition of the balance brought forward made up £834, which was available for division. The number of consumers in the six months covered by the accounts increased slightly; but the consumption of gas fell off to the extent of 294,500 cubic feet. In 1895, the Directors were able to sell coke at 16s. per ton. This year they were only able to obtain, on an average, 13s. 6d. per ton. The cost of making the gas per ton of coal carbonized was practically the same as before. Though prepayment meters were not always an unmixed blessing, the number in use had increased from two in 1895 to 37 this year. The Company are, however, doing very well in this branch of their business. A dividend of 3 per cent. for the past six months was declared.

At the meeting of the Bristol Gas Company next Friday, the accounts presented by the Directors will show an expenditure of £5183 for capital purposes in the six months ending June 30—£2179 being for mains and service-pipes, and £1689 for new stoves. The total expenditure on capital account is £913,694, which with the special increase of capital on the conversion of stock—£444,250—makes a total of £1,357,944; leaving a balance of £19,866. The revenue was £120,600, as compared with £133,315; the expenditure, £89,619, against £94,083. The balance carried to the profit and loss account is £30,981; this time last year it was £39,231. The sale of gas to private consumers produced about £8500 less than in the six months ending June, 1895. But in that period coal and oil cost £49,318, as compared with £43,795 now; and the total manufacturing charges came to £76,705, against £70,157. The amount available for division is £43,922. The Directors will recommend the payment of a dividend at the rate of 5 per cent. per annum on the nominal capital of the Company, which will absorb £23,337; and after payment of the interest on the debentures, there will be a balance of £3075. The Directors will also recommend a reduction of their number to six, and of their fees by £250 per annum.

The working of the Bridport Gas Company in the past year produced a profit, with the amount brought forward, of £1424, as compared with £1366 in 1894-5. There was an increase to the extent of 4 per cent. in the sale of gas, mainly for cooking and heating purposes. The total revenue from all sources was £3647, as compared with £3456. The expenditure amounted to £2640, against £2636; and the balance was £1007, against £820. The Directors recommend dividends of 8 and 5 per cent., which will absorb £937, and leave a balance of £487.

The 94th half-yearly report of the Bury St. Edmunds Gas Company shows a sum of £3840 to the credit of the profit and loss account, and a balance of £3750 at the credit of the reserve fund. At the recent meeting of the Company, the Directors recommended the payment of a dividend for the half year, free of income-tax, of 11s. per share on the 1849 capital, 8s. 6d. per share on the 1859 capital, and 8s. per share on the 1879 capital; and the Chairman (Mr. T. Ridley) moved that these dividends be declared. This was carried. The action of the Town Council in resolving to introduce the electric light was criticized, not so much because it would compete with the gas supply, as because it was forcing an unnecessary and heavy expenditure on the ratepayers.

The revenue of the Farnworth and Kearsley Gas Company in the six months ending June 30 last was £7831; the expenditure, £5207—showing a balance of £2624. The amount available for division is £7078; and at the meeting of the Company on the 27th inst., the Directors will recommend dividends at the rates of 10 and 7 per cent. per annum, less income-tax.

The profit and loss account of the Malton Gas Company for the half year ending June 30 shows a balance of £1986 available for division. The Directors recommended a dividend at the rate of 10 per cent. per annum, free of income-tax, for the past six months, which would allow of £900 being carried forward. This was agreed to at the meeting of shareholders last Wednesday. The Company's reserve fund now amounts to £3800.

The half-yearly meeting of the Matlock Bath Gas Company, Limited, was held last Thursday. The working in the six months ending June 30—the first half year under Mr W. Lister's management—has been most successful. The receipts amounted to £1398; the expenditure to £939—leaving a net profit of £459. A dividend at the rate of 8 per cent. per annum was declared, absorbing £400. The Urban District Council have submitted an offer for the Company's undertaking; and the shareholders are to be called together to consider it.

The revenue of the Mirfield Gas Company in the six months ending June 30 last was £5771; the expenditure, £3808—leaving a balance of £1963. The profit was rather lower than usual, owing to the mildness of the season. Dividends of 10 and 7 per cent. will require £2325; and the deficiency will be taken from the net revenue account.

The half-yearly general meeting of the Newport (Mon.) Gas Company was held on Monday last week—Mr. E. J. Phillips, J.P., in the chair. The Chairman, in moving the adoption of the report and accounts, stated that 177 new services had been put in during the past half year, and there had been 3313 yards, or about 2¼ miles, of new mains laid down. The revenue account was considerably less than for the first half of 1895—a state of things which had not occurred for 22 years. But this was due to the cold winter and spring of last year, leading to gas being much resorted to for heating purposes. The consumption had been less by 9 million cubic feet than in the first half of 1895, but more by 3 million feet than in the corresponding period of 1894; while the net available profit was £100 more than it was twelve months ago, owing to the saving which had been effected in coal, &c. The revenue was sufficient to pay the maximum dividends and leave a credit balance of £600. The Chairman then glanced at the progress of incandescent gas lighting, and alluded to the fact that six months ago the Corporation adopted electricity for a portion of the town. The cost of the 42 arc lamps which had supplanted 157 gas-lamps was

three times as much, or at the rate of £1050 for the year, as against £347 15s. for gas. He would not say more, except to remark that it was very hard upon the Company that they, as ratepayers, should have to contribute to the cost of the electric light. Mr. H. M. Brewer seconded the motion. In the course of his reply to a question, the Chairman said he had no fear that the electric light would prove a serious competitor with that or any other gas company. They sold gas at 3s. per 1000 cubic feet; and with the electric light at 6d. per unit, gas came to 5d. as compared with 1s. for electricity. When used in the incandescent form, gas was about one-fourth of the cost of the electric light at 8d. per unit. The report and accounts were adopted; and the maximum dividends were declared.

At the half-yearly general meeting of the Peterborough Gas Company last Wednesday, the Directors in their report announced a sum of £2808 as the balance of the profit and loss account. After paying the preferential dividend, they recommended dividends at the maximum rates on the rest of the share capital. The payment of these would absorb £2644, and leave £164 to be carried forward. The increasing consumption of gas necessitates a further outlay of money; and therefore the Board submitted a proposition to raise £3000. The Chairman (Mr. W. Harris), in moving the adoption of the report, said the period ending June 30 last was one of unusually heavy expenditure, a large part of which was a charge upon the revenue account. This, however, would not recur for many years. The report was adopted, and dividends at the rates of 10 and 7 per cent. per annum were declared. An extraordinary meeting was subsequently held, at which authority was given to the Directors to raise the £3000 of new capital alluded to in the report.

The Reading Gas Company sold in the past half year 136,048,600 cubic feet of gas within the borough, and 3,608,900 cubic feet beyond the boundary, which, with the 9,819,172 cubic feet used for the public lighting, produced £20,965. Residuals yielded £5335; and stoves, £74. The amount of the stove account, brought up the revenue to £26,374. The manufacture and distribution of gas cost £18,070; management, £1095; and rates and taxes almost as much—£1054. The total expenditure was £21,377; so that the balance carried to the profit and loss account was £4997. The balance of net profit available for division is £16,571; and at the meeting of the Company to-day the Directors will recommend the payment of full dividends upon all the Company's stocks and shares. Under the superintendence of Mr. Edward Baker, Assoc.M.Inst.C.E., 14,048 tons of mixed gas coal were carbonized in the six months; the estimated production of residuals being: Coke, 14,048 chaldrons; breeze, 155 loads; tar, 159,761 gallons; and ammoniacal liquor from which 148·4 tons of sulphate of ammonia were made.

The sale of gas in Ryde in the year ending June 30 last produced £9107; the rental of meters, £280; and residual products, £2368—the total revenue being £11,799. The expenditure in the manufacture of gas was £6771—coals costing £4165; and the total expenses were £8514. The balance carried to the profit and loss account was £3285; the amount available for division being £1805. Out of this the Directors, at the recent half-yearly meeting, recommended dividends at the rates of 9 and 7 per cent., less income-tax. Under the supervision of Mr. F. F. Farrand, 6108 tons of coal and cannel were carbonized; the quantities of residual products being estimated as follows: Coke, 3970 tons; breeze, 447½ tons; tar, 60,319 gallons; ammoniacal liquor, 119,137 gallons.

The accounts presented to the shareholders of the Scarborough Gas Company, at their half-yearly meeting last Saturday, showed a balance of £5708, out of which the Directors recommended the payment of the maximum dividends, after providing for those on the preference stock. In this way, £5472 was absorbed, and a net balance of £236 left. The sale of gas for public and private lighting produced £13,569; meter and stove rental, £845; and residuals, £2958—the total revenue being £17,472. The expenditure on the manufacture of gas amounted to £9099; on its distribution, to £1524; management cost £676; and the total expenses were £11,937—showing a balance of £5535. Under the supervision of Mr. J. Holliday, 9220 tons of coal and 87 tons of cannel were carbonized; the production of residuals being as follows: Coke, 5584 tons; breeze, 616 tons; ammoniacal liquor, 1049 tons. There were 86,220,200 cubic feet of gas sold for private, and 8,864,078 cubic feet for public lighting in the past half year.

Water Companies.

At the half-yearly meeting of the Cambridge Water Company last Thursday, the Directors recommended dividends at the rates of 10 and 7 per cent. per annum, after payment of which, there would be £5192 to be carried forward. This was agreed to. The Engineer and Manager (Mr. W. Gray) reported that in the six months ending June 30, water had been laid on to 242 premises; the total number supplied being 14,223. The condition of the works is satisfactory.

The half-yearly general meeting of the Stockport Water Company was held on the 6th inst.—Mr. G. Hill, M.Inst.C.E., in the chair. The balance-sheet showed an increase of £723 in the receipts in the six months ending June 30, compared with those for the corresponding period of 1895; and a decrease of £220 in the expenditure. After paying the interest on debentures, amounting to £1119, the profit was £9113. This sum, with £249 brought forward, made a balance in hand amounting to £9362, out of which it was proposed to pay a dividend at the rate of 6½ per cent. per annum. The Chairman moved the adoption of the report, and the declaration of this dividend on the ordinary shares, with 2½ and 2¾ per cent. on the 5 and 4½ per cent. preferential stocks. Colonel Howard, J.P., seconded the motion; and it was carried unanimously.

In the report to be presented to the shareholders of the Woking Water and Gas Company at their meeting on the 25th inst., the Directors state that the total expenditure on capital account to June 30 has been £82,568. The revenue for the past half year has been £3321; and the expenditure on revenue account, £1509, including £110, the balance of expenses incurred through the frost last year. The balance carried to the profit and loss account is £1811. The amount available for division is £1651; and the Directors recommend the payment of an interim dividend at the rate of 4 per cent. per annum for the past six months, free of income-tax, which will absorb £1527, and leave £124 to be carried forward. Owing to the long-continued scarcity of rain, and the consequent diminished yield of water, it became necessary to limit the supply in the district. The Directors at the same time gave instructions to spare no expense in raising all the water it was possible to obtain. The Directors are pleased to be able to report that complaints have not been numerous; and they desire to put on record the fact that the consumers have generally co-operated with the Company in the extraordinary difficulties which they, in common with similar undertakings, have experienced this summer. In consequence of the steps taken by the Directors, the yield of water has been maintained.

THE GAS SUPPLY OF BELFAST.

An Interesting Historical Sketch.

As already mentioned in the "JOURNAL," an interesting paper, descriptive of the Belfast Gas-Works and their history, was read at the recent meeting of the Institution of Mechanical Engineers in that city, by Mr. J. STELFOX, the Corporation Gas Engineer. The following are the principal portions of the paper:—

The gas industry may be said to date from the early years of the present century, though numerous records prove that private establishments were lighted by means of coal gas at a considerably earlier period. The first public lighting of London by gas was witnessed in 1813, on Westminster Bridge; and with the next few years, a rapid extension of the plan took place, not only in the Metropolis, but also throughout the country. In Belfast, notwithstanding its remoteness at that period, as regards time and convenience of transit, from those manufacturing centres which seem chiefly to have excited the enterprise of the pioneers in gas engineering, the subject received attention as far back as 1817, when the original projectors of the gas-works appear to have been represented by Mr. E. Spear, with Messrs. Barlow Bros. as engineers and architects for the undertaking. About 1821, a start was made on a little plot of land on the Ormeau Road; the site being now occupied by a portion of the present offices, and by the retort-house of the old section of the works. The contract for laying the necessary pipes and services was given to Mr. C. B. Robinson, of London, whose name was afterwards well known in connection with the gas undertakings of Leicester, Coventry, and Leamington, and with the gas industry generally. The works were first brought into use in the autumn of 1823, and in the "Belfast News-Letter" of Sept. 2 of that year appeared a long and interesting account of the new undertaking.

The works stood well out of the town of that date, and covered an area of about 1½ acres; having a frontage to Ormeau Road of 220 feet, and a depth of about 300 feet. The retort-house was 100 feet long by 36 feet wide, and contained 45 cast-iron retorts, from which the possible make could not have exceeded 100,000 cubic feet per day; while the actual production was probably not nearly so much, even in midwinter. The purifiers seem to have been boxes 4 feet square; and the station meter passed 50 cubic feet per revolution. The largest of the six meters now in use is capable of passing 57 times this quantity. There were three gasholders, 40 feet in diameter and 15 feet deep; and each contained 18,500 cubic feet, or 55,000 cubic feet in all. The latter amount may be taken as fully equal to the largest day's consumption. During last winter, the largest day's consumption was about 133 times as much; amounting to 7½ million cubic feet. An unprofitable period of difficulties was happily terminated in 1852, when the management was entrusted to the writer's father, to whose patience, perseverance, and energy it is due that the concern was rescued from the quagmire of financial failure, and placed on so sound a foundation that, when it was purchased in 1874 for the community, the operations were being so carried on as to render the transfer a great public benefit. In 1852, the gasholder accommodation began to prove insufficient, the full storage being about 290,000 cubic feet, and the maximum day's consumption about 430,000 feet; and within a month of the new Manager's appointment, he was called upon to undertake an extension in this direction, which was carried out during the following year. The new gasholder—at that time considered colossal—was 100 feet in diameter, rising to a height of 50 feet, and containing when full about 380,000 cubic feet, which is equal to about 25 minutes' supply during the period of present maximum consumption. It is still at work, and rendering excellent service.

The producing and purifying plant next became too small; so that extended retort-houses and purifiers had to be provided. As regards the former, after utilizing an old coal-shed as a retort-house, and tinkering up the old benches, it was thought desirable to build an entirely new house over the top of the existing benches, and to cover new ground for further expansion in this department. The obligation to keep things going, rendered it necessary, however, to follow the lines of the old house; a necessity which has resulted in great inconvenience of working. A set of purifiers, each 10 feet square, had been added, but served only for a short time to stave off trouble; and therefore it was resolved to add another set of 12-feet boxes, which it was then supposed would meet all requirements. By 1861, the daily output had reached a maximum of over a million cubic feet; and the storage had again become insufficient. It was accordingly resolved to put up a still larger gasholder, 110 feet in diameter, rising 52 feet, and holding when full about 560,000 cubic feet. This was placed on the space occupied by four of the six small holders; and the tanks of the remaining two were converted into tar and liquor wells. While the work was being carried out, an accident occurred which momentarily jeopardized the supply of gas to the town for the whole winter. The wall of the new tank fell in, carrying with it the wall of the neighbouring tank and the gasholder as well. Fortunately the community were spared the threatened catastrophe, and the two tanks were rebuilt—the one which was replaced being made larger than the original; so that, by the following year, the storage for gas had been increased to about 1,350,000 cubic feet—the daily maximum being nearly 1,250,000 cubic feet.

Up till 1865, all the coal used in the works had been carted from

vessels at the quay; and the low cartage rate of only 7d. per ton gave no inducement for a change. Gradually, however, coal-vessels had to discharge at a greater distance from the works, and wages and other charges began to increase; causing the cost of cartage to rise from time to time, until it reached 1s. 2d. per ton. All coal was then received into barges and brought alongside the gas-works wharf, where it was discharged as before by means of bags, which were carried from the barges to carts and from the carts into the retort-houses and stores. To facilitate delivery, the retort-houses were placed as near the front gate as possible—a somewhat undesirable arrangement, which would not have been adopted if it could in any way have been avoided. The cost of transit from the wharf was 8d. per ton, and the lighterage 5d.; so that a saving was effected, but only to the trifling extent of 1d. per ton. The congestion caused by the constant stream of coal-carts entering and leaving the gate, and impeding the vehicles coming for coke or bringing lime into the works, became each year more serious, and showed that the time was near when it would be impossible in this way to bring into the premises sufficient coal for a day's working. Meanwhile, another gasholder was erected of 150 feet diameter, which, when fully elevated, contained upwards of 1 million cubic feet; and a still larger one, capable of holding 1½ million cubic feet, was completed in 1874. Two years later, the first attempt was made to deal with the congestion consequent on the coal delivery, by the establishment of an elevated platform and railway, served by hydraulic cranes at the wharf, which was reconstructed. The rails were carried into every division of the retort-houses; and by means of a hoist, the waggons were elevated to a still higher level of rails running through the roofs of the existing coal-sheds. The trouble experienced in carrying out this work was great, and the cost about £6000; while the saving effected was only about 2d. per ton. Its real usefulness, however, lay in doing away with all the former bustle in the yard, when the utmost that could be taken in per day was only 240 tons; whereas now 700 tons can be taken in with ease, working only one crane, and the yard is freed from this source of congestion.

In 1884, it was decided to make a trial of stoking machinery in the retort-house. The buildings were unsuitable for machines, on account both of their narrowness and their want of length; and in one division only has it been found practicable to work the plan, which is that of Mr. John West, of Manchester. The coal is broken into small pieces in the coal-shed, and elevated on to a high-level band, whereon it is conveyed to hoppers situated at the end of the retort-house; and from these the charging-machines are fed. The machinery is actuated by compressed air, at a pressure of about 70 lbs. per square inch. Similar machines of improved make have been provided in the retort-house not yet in use. These will be worked by ropes; the power being obtained from engines placed near the end of the house. With the advent of hydraulic power, numerous appliances were rendered desirable and practicable. Capstans for coal and coke haulage, lifts for covers of purifiers, cranes for coke storage, and small hoists for various purposes have been put up; all of which are worked by water power supplied by a small steam-engine, having a pair of cylinders of 14 inches diameter and 12 inches stroke. The steam pressure is 40 lbs. per square inch; and the hydraulic pressure, 700 lbs. Two accumulators are in use; one of 8 inches diameter with 11 feet rise, and one of 12 inches diameter with 15 feet rise.

The new appliances were at once called upon to meet increased and increasing demands. The consumption of gas had risen from 416 million cubic feet in 1874 to 562 millions in 1881; and the addition of still another gasholder of 190 feet diameter, with a rise of 90 feet and a capacity of 2,400,000 cubic feet, brought up the total storage capacity to 6 million cubic feet. Gradually, too, the new retort-houses were brought into use, until his reserve became part of the daily working in winter, and no margin remained for emergency. The rush of gas was so great that the purifiers were at times quite overpowered, and blew their water-seals, causing a serious loss of gas and great risk; for, on one occasion at least, the escaping gas ignited, and but for the prompt action of the foreman there might have been a calamity. Every addition of buildings or apparatus in order to produce more gas meant the occupation of valuable space. If the land question seems to have been always a burning one in Ireland, it has certainly been so in the latter history of the Belfast Gas-Works. As the space originally intended for purifiers was the only ground on which a retort-house could be built, in 1891 a new structure, with most modern settings and appliances, was commenced thereon, and is now ready for work; but other appliances about to be described have thus far prevented it being brought into use. It forms practically a third complete section of the works; being provided with a full complement of condensers and exhausters.

To make up for the loss of ground intended for purifiers, it became evident that there was only one way out of the difficulty, and that was upward. Accordingly a set of overhead purifiers has been designed and erected. The structure is mainly of steel, of which some 1200 tons were used. The upper floor, which is 150 feet by 120 feet, is reached by means of two hydraulic elevators, and will afford storage for upwards of 2000 tons of lime when trimmed to a height of 3½ feet. The lime is taken up and slaked on the upper floor, and, when properly prepared, is discharged through apertures in the floor by means of canvas hose-pipes about 10 inches in diameter. This method of distributing lime has been used successfully for years past in Glasgow and elsewhere. When it is necessary to change the purifying material, that which is spent is discharged to the ground-level through apertures in the bottoms of the purifiers. This work has been carried out in a highly efficient manner by the contractors, Messrs. Hanna, Donald, and Wilson, of Paisley. In bringing up the establishment to its present producing power, it will be readily understood that the connections, both over and under ground, formed no small part of the difficulties to be overcome. The pipes were becoming not only more numerous, but larger also. The former connections, of which the largest did not exceed 12 inches in diameter, had to be replaced by sizes increasing from 18 up to 36 inches. The lines, too, had to cross frequently; necessitating great depth of excavations and of mains.

About 1865, when a problem of special difficulty presented itself, the writer was fortunate enough to hit upon a simple plan for accomplishing the desired end. While the inlet-pipe is connected in the ordinary way to the scrubbers, the outlets from the latter pass into a box which surrounds the inlet; and it is from this box that the main outlet issues. So useful did this method prove that advantage was soon taken of it in a modified form for the crossing of existing mains, by constructing a crossing-box in halves, with flanges set at an angle of 45° from the horizontal line, so as to afford room for the inlet and outlet sockets. The latest of these crossing-boxes have been fixed in the connections from the water-gas extension, which have thereby been rendered a comparatively simple matter.

All these extensions and schemings, however, would have availed but little, had not an invention been fortunately met with some four years ago, which is due to the ingenuity and ability of American gas engineers. The making of water gas, carburetted with liquid hydrocarbons, was attempted as much as fifty years ago, but without success. At that time the bulk of the hydrocarbons never got beyond the vapour stage; and on cooling the gas, they promptly resumed the liquid form. Various processes were tried without success; and, indeed, with coal plentiful and cheap, and labour moderate, there was no idea in this country of carburetted water gas as a possible competitor of coal gas. Different conditions, however, prevailed in the United States, where coal was dear and labour expensive; while crude oils and naphtha were to be had at low rates. Naturally, therefore, the gas engineers turned their attention to the manufacture of water gas and its enrichment by means of petroleum distillates. Many of the earlier devices were clumsy and unsatisfactory; but the result of years of experimental work was the modern Lowe system. Knowing that this system would at least produce a large quantity of gas on a small space, and would furnish an outlet for coke instead of producing more, the writer four years ago consulted Messrs. Humphreys and Glasgow; and, the project being warmly supported by the then Chairman of the Gas Committee (Mr. C. C. Connor), an order was given to them for an apparatus equal to the production of 1½ million cubic feet per day. This apparatus was set to work at Christmas, 1893, and has been in constant daily use from that date. It is remarkable alike for its great simplicity and for its large efficiency. Gas making can be stopped at any moment, and resumed at a minute's notice; and a set which has been lying off for some days can be turned into full work in half an hour, while a set which has been so long out of work as to have become quite cold can easily be set going in three or four hours. [The author then described the process of water-gas manufacture.]

In addition to the ease with which water-gas apparatus can be put into or out of action, there are other advantages arising from its use, among which may be specially mentioned the following: The ground occupied by the water-gas apparatus need not be more than one-eighth of that required for retort-houses capable of producing an equal supply of gas; and the oil-storage tanks occupy about one-fifteenth of the area which would be required for an equivalent coal-storage, assuming the coal to be piled up to a height of 15 feet. The cost of water-gas apparatus would hardly exceed one-half of that required for coal-gas works; while the charges for maintenance and repairs are comparatively trifling. By means of steamers' pumps, 2000 tons of oil can be pumped into the storage-tanks in 36 hours, through two miles of 6-inch pipes. For gas making, this is the equivalent of 20,000 tons of coal, which would be equal to the cargoes of 50 ordinary steam-colliers. The labour involved in transferring this quantity of coal into barges, carrying it to the works, and distributing it in the retort-houses and stores will be readily appreciated. The water gas system gives control as regards the production of coke, and also provides profitable use for a portion of that which is made in the ordinary way. It is possible, indeed, to arrange such a balance of the two systems as would leave no coke for sale; but it is not likely that such a method of working would be wise or profitable. The water gas is made in immense volume, and from hour to hour can be relied on to undergo but trifling variation as to quantity or quality. When making gas of 24 to 26 candle power, each run of seven minutes produces about 9000 cubic feet; so that one set of apparatus is capable of yielding over 900,000 cubic feet in 24 hours. During the past season, one set has produced on several occasions a million cubic feet in 24 hours. The economy in respect of labour saving is great. Each operator will produce in an eight-hour shift upwards of 300,000 cubic feet of water gas; whereas the make of coal gas rarely exceeds 18,000 cubic feet per man.

At present it is difficult to estimate what this would be to any concern depending on the day's market for supply of oil. In comparison with such qualities of gas as could otherwise be produced only by the use of cannel, there would certainly be a marked economy. The cost of oil to the Belfast Gas-Works for the year ending June 30, 1895, was 2·214d. per gallon; and at this rate, a saving was effected in cost of production of 1⅛d. per 1000 cubic feet over the whole make both of water gas and of coal gas—the average production of water gas being one-third that of coal gas. The current year, it is trusted, will show still better results; but as these would be obtained with oil purchased under peculiarly favourable circumstances, the figures, even if available, would be misleading. The writer, however, has not found any reason to change the opinion expressed in his paper read to the Incorporated Gas Institute in June, 1894—that with oil at 2½d. per gallon, carburetted water gas of 21-candle power can be produced for less money than 17-candle power coal and cannel gas. Carburetted water gas had been in use in London for some years prior to its introduction into Belfast. But it seemed to be regarded there rather as a means of meeting an emergency than as a regular factor in the daily make; and the stated cost of the water gas was so high as to offer but little inducement towards the adoption of the plan.

Since the experience in Belfast with the most modern apparatus has been made known, water gas has been taken up seriously in no fewer than 15 other cities and towns in the United Kingdom, notwithstanding the sudden rise in the price of oil; doubtless but for the latter, the number would have been considerably increased. In every place where the apparatus has been got into work, it seems to have given entire satisfaction. In Belfast, after eighteen months' working, it was decided to supersede gradually one of the retort-houses with water-gas apparatus. At present one bench of retorts has been removed, which was capable of producing 900,000 cubic feet per day; and part only of the space thus acquired has been occupied by four sets of water-gas apparatus, capable of turning out 4 million cubic feet per day, or four and a half times as much as was produced by the retorts.

Meanwhile the demand is still going on apace. Fifteen years ago, these gas-works were pronounced commercially dead; while yet the consumers have continued to demand from them all the work and service expected only from a flourishing vitality, and a power of growth has been developed not usually manifested by a moribund concern. Measuring this growth in millions of cubic feet per annum, the progress in decennial periods has been as follows: Year ending June, 1825, 10; 1835, 24; 1845, 51; 1855, 109; 1865, 248; 1875, 418; 1885, 718; and 1895, 1169. This growth is still continuing; and notwithstanding prophetic warnings that the gas industry is already on the wane, the writer ventures to maintain that it has not yet nearly reached its zenith, and to predict that for many a long year the citizens of Belfast will continue to regard with appreciative interest the familiar row of chimneys along the Ormeau Road which pertain to the Corporation gas-works.

THE PRICE OF GAS AT MIDDLETON.

At the Meeting of the Middleton Town Council on the 6th inst., the Chairman of the Gas Committee (Alderman Walker) brought up their minutes, which included the following resolution: "That, in order to carry out the resolution with respect to the reduction in the price of gas passed at the last meeting, the gas be reduced 5d., and the discounts 2d. per 1000 cubic feet; leaving the net reduction 3d." He said he was sure that, as a result of the Committee's action, gas would be more used in cottages, and be more generally consumed. He moved that the minutes be passed. Alderman Lees submitted that, inasmuch as the price of gas for lighting purposes had been reduced 3d. per 1000 cubic feet, the Committee ought also to reduce the difference in the price of gas for heating, cooking, and motive power. Previously they had a differential rate of 6d., which was now reduced to 3d.; and this, he submitted, was rather going back in their ideas, instead of encouraging, as they had been trying to do for many years, an increase in the consumption of gas for cooking purposes. At present 3s. 1d. per 1000 cubic feet for lighting would leave gas for cooking, &c., at 2s. 10d. He suggested that the Committee would be consoling with more consistency those advocates in the Council who had a good deal to say about smoke, if they would give the cottagers an opportunity of preventing it; and he thought the Council would agree with him that they ought to make a greater distinction between the charge for gas for heating and lighting than the proposal of 3d. He moved in Committee that the 6d. previously existing should remain at 6d. when the price for lighting had been dropped 3d.; and this motion, in a small Committee of four, was only defeated by the casting vote of the Chairman. As a consequence, he cheerfully fell in with the views of the majority. Taking Rochdale as an example, there was there about 1s. difference between gas for lighting and for cooking, &c.; and in Middleton, he believed, without charging annuities and the interest on the sinking fund, and taking into consideration the price of residuals, gas only cost the Corporation 1s. 5d. per 1000 cubic feet to make. He should be glad if this matter were referred back to the Committee for consideration; otherwise he should like to move that a difference of 10d. be made. After some discussion, Alderman Walker said he did not object to a reduction in the price of gas, but should be very glad to see further reductions. The profit last year was £1349. By the resolution of the Committee, they gave away £921, which, in his opinion, was sailing near the wind. There was no coal strike last year, but there was the year before; and there was an agitation this year, and every reason that the Gas Committee should not give away the last farthing they had. It was his opinion that, with the present reduction, the cottagers now using oil-lamps—with which there had been many accidents—would cease to use them, and come for gas. The minutes were passed.

New Water-Works for Witney.—The Witney District Council have resolved to carry out a scheme for providing new water-works for the town, at a cost of £4250.

Reduction in Price.—The Littlehampton Gas Company have notified a reduction of 2d. per 1000 cubic feet in the price of their gas to householders; and they have offered to replace the burners at present used for the public lighting by incandescent burners, provided the District Council will bear half the cost.

Sheffield Corporation Water Supply.—The Chairman of the Water Committee of the Sheffield Corporation (Alderman Gainsford) made an interesting speech at the meeting of the Council last Wednesday, when he reviewed the progress of the water undertaking during the eight years it has been in the hands of the Corporation. He expressed the satisfaction of the Committee at the work of the staff, especially that of Mr. E. M. Eaton and Mr. W. Terrey, and concluded by stating that, as the result of recent legislation, Sheffield is now prepared with water for 34 years to come.

The Lighting of Douglas (Isle of Man).—At the meeting of the Douglas Town Council last Thursday, the Deputy-Mayor (Mr. Alderman Webb) presiding, the report of the Sub-Committee appointed to negotiate with the Douglas Gas Company for a general scheme of public lighting was submitted. It showed that the Company agreed to supply all the town with incandescent gas-burners, and to maintain them for a period of five years, at a cost of £2 14s. 4d. per lamp. The adoption of the report was strongly supported by Mr. Clinch, who contended that the lighting of Douglas was at present inadequate both in summer and winter. He said that, if the Council accepted the proposal, the town would be lighted by incandescent lights as cheaply as it was now lighted by ordinary burners. Mr. Barron moved, and Alderman Curphey seconded, an amendment to the effect that the matter be delayed with the view of interviewing the Electric Tramway Company as to the cost of supplying electric light throughout the town. Alderman Proctor contended that, if the town was to be lighted by electricity, the electric installation should be owned by the Council, and worked for the benefit of the ratepayers. On being put, the amendment was lost; but a subsequent amendment, delaying the matter for three months, was agreed to.

DEVONPORT WATER SUPPLY.

The Proposed Purchase of the Water-Works by the Corporation.

Arising out of the proposal of the Corporation of Devonport to acquire the undertaking of the Water Company, the members of the Borough Council recently paid a visit to the works. The supply is derived from the high lands of Dartmoor; and the party, which consisted of the Councillors and the Borough Surveyor (Mr. J. F. Burns) drove along the leat which pursues a winding course of some 30 miles to its main source, the West Dart River. The intake at Dart weir is situated about four miles east of Princetown; the watershed covering an area of 4460 acres. In dry seasons, the whole volume of the West Dart passes into the leat, which in the course of the next four miles receives additional supplies from two smaller streams, the Cowsick and the Blackadon Rivers. After pursuing a circuitous course across the moors and downs, the leat empties into a reservoir which has recently been constructed at Belliver, near the village of Roborough. This reservoir has a capacity of only 2 million gallons; but it serves the important purpose of equalizing the pressure in the pipes which convey the water onward from this point. At Crownhill, two or three miles nearer Devonport, there is another reservoir with a storage capacity which has recently been increased from 16 to 18¾ million gallons by raising the sides. There are also six large filter-beds, with a capacity equal to three times the present average consumption. From the filter-beds, the water passes into the mains. The first halt was made at the Crownhill reservoir filter-beds, where everything was in admirable order. At Crownhill and at Bellevir, where the party also halted, the Borough Surveyor, in the absence of Mr. H. Francis, the Engineer to the Company, explained the method adopted for storing, purifying, and distributing the water. The inspection over, the party had dinner at Princetown. In the course of the speeches, testimony was borne to the excellent manner in which the Water Company had served the town; but it was generally agreed to be desirable that the Corporation should now acquire control over the supply.

HUDDERSFIELD CORPORATION WATER-WORKS.

The New Reservoirs—Treatment of the Water by Carbonate of Lime.

On the occasion of the recent annual visit of the Water Committee of the Huddersfield Corporation to the water-works in the Wessenden Valley, Marsden, information of an interesting nature was furnished to them as to the progress of the Butterley reservoir. When the Committee visited Butterley a year previous, it was found that a serious difficulty had to be overcome. The strata at the lower end of the valley, near Marsden, where the puddle trench which will form the backbone of the embankment is being made, were of such a loose description that it became necessary to sink the trench to a much greater depth than had been expected. After sinking to a depth of 120 feet, and encountering a stratum of rock, a substantial and water-tight bottom was found. Since last year 35,000 tons of concrete have been put into the trench, which is now brought up to the level of the bed of the Wessenden Brook. When completed and filled, the reservoir will contain 400 million gallons of water, covering an area of 43 acres. This reservoir will be mainly used for the supply of compensation water to the millowners in the Colne Valley, to the amount of not less than 2,258,640 gallons per working day; and any surplus that may be left will be used for the general supply. With regard to the Blakeley reservoir, which will complete the scheme of the Corporation in the valley, and the site of which is immediately above that of Butterley, borings were made some time ago to examine the strata, with a view to the making of the necessary puddle trench. Recently the Corporation obtained an extension of time for the construction of this reservoir to the year 1901, although the actual construction has not yet been determined upon. Should the reservoir be constructed, its holding capacity will be 80 million gallons. The foundation is believed to be very sound; and the reservoir could be made at comparatively trifling cost. There seems to be a difference of opinion among members of the Council as to the necessity of making the reservoir, as the present works are estimated to be capable of supplying the people dependent upon the Corporation for their water for twenty or thirty years to come. The estimate is based upon the assumption that the increase of the population will go on at a normal rate. It is interesting to note, however, that within the last twenty years the population supplied has increased from 60,730 to 146,325; while the number of houses supplied has advanced from 12,146 to 29,265. An immense increase has also taken place in the consumption of water for trade purposes. In 1875, the daily average consumption was 129,339 gallons; while last year the daily average was 1,289,312 gallons. Taking the consumption both for trade and domestic purposes, the increase has been from 979,559 to 4,433,836 gallons. The total amount of capital expenditure upon the water-works up to March, 1895, was £1,064,984; and for this outlay Huddersfield has seven storage reservoirs, which have a united capacity of 1159 million gallons; and when full will provide a water supply, at the present rate of consumption, for 200 days. Great interest was manifested by the Committee in the experiments which are being made at the Deerhill and Blackmoorfoot reservoirs, the latter of which is the largest owned by the Corporation, having a capacity of 700 million gallons. In April last, after consultation with an eminent chemist, the Water Committee decided to add carbonate of lime, with the object of neutralizing the effect which rain-water gathered from the moorland has upon lead service-pipes. At Deerhill the carbonate of lime will be added by mechanical means in a short time; and at Blackmoorfoot, where the experiments were first made, the treatment by such means has already produced successful results. In the catch water to the Blackmoorfoot reservoir, settling-tanks have been made; and the water is filtered through the limestone, passing to the reservoir in a thoroughly pure state.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

A somewhat curious statement falls to be made this week. The tall chimney at the Edinburgh Gas-Works, which more than a year ago was discovered to have gone 5 feet off the plumb, remained practically stationary during the months which were taken up by preparations for the erection of a new chimney; and now, when the new one is about half built, the old chimney has started to come back. It went eastwards first; and it is now returning westwards. It has not yet quite attained the perpendicular; and there is no saying whether it ever will. Such erratic movement on the part of an ungovernable mass like a chimney is disquieting to those about it. Indeed, it is more disquieting that it is coming back than if it had gone further in the same direction, as it argues something more generally wrong with the foundation than would be the case if it only went in one direction. Meantime, nothing can be done. As I have said, the new chimney is about half way up. It will take a month or two to complete it, and about the same time to test and season it; so that the probabilities are that it will be next year before a start can be made with the razing of the old chimney.

The Institution of Junior Engineers are on tour throughout the provinces, viewing great engineering works. They were in Edinburgh to-day, where they were "received" by the Corporation, and afterwards visited the Edinburgh Gas-Works, over which they were shown by Mr. A. Masterton, who has charge of the works in the absence of Mr. Mitchell. A section of the members visited the service reservoir and filtering-ponds of the Edinburgh and District Water Trust at Alnwickhill, which they were shown by Mr. Oliver, the Collector to the Trust. On Monday they visit the Forth Bridge; and afterwards they proceed to Glasgow, Dumbarton, and Wishaw, to visit large works there. On Tuesday they are to be shown over the Dawsholm Gas-Works of the Glasgow Corporation by Mr. W. Foulis, the Engineer to the Corporation; they are also to visit the new reservoir at Craigmaddie, belonging to the Corporation.

At the Stirling Police Commission on Monday, the following minute by the Gas-Works Committee, in reference to the negotiations for the transfer of the Stirling Gas Company's undertaking to the Corporation, was read: "A letter was received from the Secretary to the Gas Company, in which Mr. Gentleman stated that he had an opportunity of seeing Mr. Johnston and Mr. Chrystal; and these gentlemen agreed with them that at the meeting between the Commissioners and the Company the question of the inspection of the Company's books by an Accountant nominated by the Commissioners was neither contemplated nor considered. They were quite willing that, on the terms stated, an expert (of the Commissioners' nomination) should examine the Company's works and plant; but farther than that they were not prepared to go. The Company were still willing, on the terms stated, to give the expert a perusal of the reports obtained by the Company from Mr. Gillespie and Mr. Morison. The Committee, while their recollection was that access was to be given to the books, do not press this in the meantime, as there appears to have been a misunderstanding as to this on the part of the Company's Committee. Mr. Govan stated that he had requested the Clerk to ask Mr. M'Gilchrist to attend the meeting, with the view of instructing him to examine the works and plant of the Company, so as to report thereon to the Committee. In completing his report, Mr. M'Gilchrist will get access to the report prepared for the Company by Mr. Gillespie, as stated in Mr. Gentleman's letter, and to the report of Mr. Morison, the Accountant employed by the Company, if desired. Mr. M'Gilchrist is also authorized by the Committee to obtain such information as he may require with reference to the valuation of the Company's buildings, and otherwise. Instruct the Clerk to intimate to Mr. Gentleman that Mr. M'Gilchrist has been appointed by the Committee to examine the works and plant, and see Mr. Gillespie's report, and that the Accountant will be named later." Mr. Govan moved the approval of the minute. In doing so he said that the Committee at first were somewhat disappointed at the objection taken to the Accountant on the Commissioners' behalf going over the books; but at the meeting Mr. M'Gilchrist assured them a thorough overhaul of the books might not be necessary. He would go into the matter so far as he could; and if he thought it advisable to see the books, he would let the Committee know. The Committee did not specially advise Mr. M'Gilchrist to go over the report made by experts on behalf of the Company; and if any information was desired, Mr. M'Gilchrist would put himself into communication with the Company as soon as he thought it advisable. It might not amount to very much; but at the same time they were making a fair effort to get at the value of the works. The report was approved of.

I omitted to mention last week that the strike among the stokers and firemen in the Falkirk Corporation Gas-Works had been settled by the men's places being filled up by outsiders. The piecework system of remuneration is thus established in the works. I daresay it has been tried elsewhere, though I have never heard of its being so. The intention of Mr. P. B. Watson, the Manager, is to make the men careful in the use of gas, with a view to reducing the large quantity consumed on the works—an item which is almost universally deplored as being too high.

The Dalkeith Gas Company—the Manager of which is Mr. A. Bell, senr., the President of the North British Association of Gas Managers—have got into a dispute with the Police Commissioners of the burgh. At a meeting of the Police Commissioners on Monday last, Provost Murdoch referred to the subject, which had reference to a threat made by the Company, who supply the town with gas, that for the future they would not give discount on the payment of the burgh's gas bill, on account of the Commissioners having wrongly assessed them for water. For several years the Commissioners had charged them full rental for the water; while during the same period they charged all other works in the burgh on one-fourth only. The Provost strongly criticized the course taken by Mr. Gray, the Secretary of the Company, who, he said, had for some six years been Provost of the burgh, and should have been aware—if any man was aware—on what principle the assessment for water was made. He (Provost Murdoch) considered that in Mr. Gray's language there had been an attempt to make the ratepayers believe that the Commissioners had been the party making a threat to take the matter to Court, whereas it was the Company themselves who raised the controversy and threatened the Commissioners. As to the intimation that the Company would not give any discount to the burgh on their paying their gas account, he (the Provost) did not believe the Directors, or any Committee responsible for directing the Company, ever gave such authority.

The Town Council of Glasgow, on Monday, resolved to adopt a new design by Messrs. Macfarlane and Co., of Glasgow, of a lamp pillar and pendant for electric arc lamps; the arm to project 3 feet from the pillar. Hitherto the arc lamps in Glasgow have been fixed on the top of the pillar, like ordinary gas-lamps; and they have not given satisfaction. An experiment is to be made with eight of the new lamps at the west end of Sauchiehall Street.

At a joint meeting in Perth this week of the Police, Gas, and Water Commissioners, Lord Provost Dewar moved that it be remitted to a Committee to frame a Bill for next session of Parliament. The first object of the Bill would be to confer powers upon the Gas Commissioners to construct new gas-works upon ground at Friarton. They also wanted to make a new road, already begun, as an access to the manure depôt and the gas-works. The road would not only be an access, but would effect a saving of about £1500, by shortening the length of the gas-mains. In regard to this matter, they did not require to employ any special engineer, as their Manager (Mr. A. Wilson) would do the work. The motion was adopted, and a Committee appointed. The first active step in the matter of the transfer of the gas-works to a new site has thus been taken; and Mr. Wilson will have his hands full for the next year or two. In connection with the plans for the new works, the Works Committee of the Gas Commission, on the same day, authorized the Special Committee to visit several gas-works in England, where labour-saving appliances may be seen, and to report. The Manager reported that the quantity of gas made since May 1 exceeded that for the same period of last year by 1,397,000 cubic feet. The yield of gas per ton of coal this year is higher than it was last, on account of a better class of coal being used, and of the new retort-settings getting into good working order. The average illuminating power of the gas was 26·80 candles.

The Johnstone Police Commissioners, in consideration of the good results of last year's working of the gas undertaking, have advanced the salary of their Manager (Mr. R. L. Deans) by £10 a year.

A meeting of the Directors of the Pitlochry Gaslight Company was held on Thursday, at which it was agreed to accept the offer of Messrs. Henry Balfour and Co., Limited, of Leven, Fifeshire, to construct a new gasholder, of 30,000 cubic feet capacity, for £2115. A meeting of the shareholders is to be held soon, to consider as to the formation of the Company into a limited liability concern.

The Coatbridge Town Council on Thursday agreed to an offer by the Gas Company to supply gas, light and extinguish, and maintain the public lamps during the next lighting season—from Sept. 1 to April 30.—for 20s. 9d. for 3-feet, and 24s. 6d. for 4-feet lamps. The Scottish House-to-House Electricity Company, of London, wrote stating that they considered £24 per electric arc lamp for all-night lighting from Sept. 1 to April 30 a reasonable sum to charge. They also pointed out that in London £27 to £30, and in other places as high as £35 per lamp, is paid for all-the-year-round lighting. The Company further offered, if the Commissioners desired it, to supply current at the rate of 4½d. per unit. The Commissioners thought that the prices proposed were too high; and with one dissentient they agreed to offer £15 per lamp. The dissentient considered that electric lighting should be swept off the streets altogether.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Aug.* 15.

Sulphate of Ammonia.—The past week has witnessed a further decline of prices, and perhaps a weaker tone than has been experienced for many years. This has not been occasioned by any recent falling off in exports; the shipments being about on the same scale as those over the same period of last year, and the excess of about 14,000 tons on the year up to the end of June being still maintained. Neither has it been brought about so much by increased production, as by the persistent "bear" tactics of speculators. Everywhere abroad buyers have been plied with offers, both for forward and near delivery, at below makers' prices; and to such a point has this been carried, that buyers will now scarcely entertain business at all, anticipating still lower prices. It follows that most of the buying on the home market has to be done by the said speculators; and they are having matters very much their own way. Available supplies in England are not large; but it unfortunately happens that the supply in Scotland is plentiful, so that Scotch makers are of necessity leading the way in the downward march—the makers in England bringing up the rear. Values at the close are £7 12s. 6d. per ton Leith; £7 15s. Hull; and £7 16s. 3d. Liverpool. For the early months next year, orders have been booked at about £8 2s. 6d. per ton f.o.b. Having regard to the position of nitrate of soda, and to the value of other nitrogenous material, it is difficult to believe that such a low range of prices for sulphate of ammonia can be maintained; but, since the entire speculative interest lies in declining prices, it is impossible to predict when the long looked-for recovery in values may come. Meantime, it may safely be said that present prices are much below what is justified by the general situation, apart from speculation.

Nitrate of Soda remains steady, but quiet, at 8s. per cwt. for fine quality.

LONDON, *Aug.* 15.

Tar Products.—There is now a little better supply of tar, and distillers are becoming a trifle more active. The production of tar during the past season has been disappointing; and manufacturers in many cases are in arrears with their contracts for products. To this cause may be attributed the tightening in some values. Solvent naphtha is in good request at improving rates. Benzols remain steady. Carbolic acid is somewhat weaker, with a tendency to lower prices. Anthracene is firm. There is little or none of it in the makers' hands; and the

Committee are stated to be well covered. The position is undoubtedly a stronger one than it has been for some time. Creosote and tar grease oils are in better demand; and prices have slightly improved.

The following prices represent business transacted during the past week: Tar, 19s. to 27s. 6d. Pitch, 30s. to 32s. Benzols, 90's, prompt, 3s. 9d.; forward, 3s. 6d.; 50's, prompt, 2s. 9d.; forward, 2s. 7½d. Toluol, 2s. 4d. Solvent naphtha, 1s. 5d. Crude, 30 per cent., naphtha, 1s. 1½d. Creosote, 1¾d. Fluid, 2¼d. Heavy oils, 45s. Naphthalene, 65s.; salts, 35s. Cresylic acid, 1s. Carbolic acid, 60's, 2s. Anthracene, "A," 10½d.; "B," 8½d. to 9d.

Sulphate of Ammonia continues flat and uninteresting. For prompt delivery, quotations vary from £7 12s. 6d. north-east ports and £7 15s. to £7 17s. 6d. southern and western ports, less 3½ per cent. For forward business, probably 5s. more would be obtainable. Gas liquor is nominally quoted at 6s. to 7s. per ton.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—Extreme quietude now prevails in the coal trade; the recent temporary briskness having altogether disappeared. Pits generally have had to go on to three to four days per week; while prices have receded to the low level ruling prior to the exceptional pressure of orders during July. At the pit mouth, best Wigan Arley averages 9s. 6d. to 10s. per ton; and Pemberton four-feet and seconds Arley, 8s. to 9s. In the shipping trade, business is very quiet; and prices are again ruling low.

Northern Coal Trade.—There is now a continuance of the full demand for steam coal which has been noticed during the past few weeks; and there is also an increasing business in gas coals, as the collieries generally are working full time. Gas coals are steady. The price quoted is about 6s. 6d. per ton f.o.b. for good Durham qualities, for occasional cargoes; but it is expected that this rate may be advanced a little later, when the demand for larger quantities on contract shows itself, and leaves a smaller margin for these sales. Some little anxiety still shows itself as to the labour question, for the one Board of Conciliation in the coal trade of the North-east is now running to its termination; but it is believed that for the winter there will not be much change, except local ones at specific collieries. Gas coke continues very dull, though there is a renewal of exports. The production, however, is increasing.

Scotch Coal Trade.—The improvement noted last week still continues; but it has not advanced far. Ell of the best sorts is in good demand, with firmer values; and the second qualities are also more in request, with quotations a shade higher. Splint is plentiful; but there is sufficient outlet for it, and the rate remains as last week. The prices quoted are: Main, 6s. per ton f.o.b. Glasgow; ell, 6s. 6d. to 7s.; and splint, 6s. 6d. to 6s. 9d. The shipments for the week amounted to 169,051 tons—a decrease on the quantity in the preceding week of 8260 tons, and on the corresponding week of last year of 5347 tons. For the year to date the shipments have amounted to 4,462,177 tons—an increase upon the same period of last year of 182,123 tons.

Calcium Carbide.—We learn that the Acetylene Illuminating Company, Limited, of No. 63, Queen Victoria Street, E.C., have concluded arrangements with the British Aluminium Company, Limited, by which they will be able to erect works of several thousand horse power for the manufacture of calcium carbide—using water power. Pending the construction of such works, the Acetylene Company have obtained the use of a considerable portion of the spare water power of the existing works of the British Aluminium Company at Foyers; and a carbide plant is now being erected there, which it is expected will be in full work during the month of October next. The Acetylene Company hold an exclusive licence for the United Kingdom, under the Willson patents, for the manufacture of calcium carbide, and also an exclusive licence under numerous patents controlled by the British Aluminium Company.

The Manufacture of Cyanide.—A correspondent, writing in the "Glasgow Herald" last Wednesday, said: "The manufacture of cyanide of potassium—an industry in which Glasgow capitalists had formerly almost a monopoly—has recently suffered material changes. The Witwatersrand gold mines are the chief consumers of the chemical; and of late the companies have been getting the principal part of their supplies from several important factories which have been started in Hamburg. As a consequence of this rivalry, the price of the 98 per cent. chemical in Johannesburg has fallen from 3s. to 1s. 10d. per pound. The exports from Germany to South Africa, which a few years ago were only nominal, have now risen to over 50 tons a month; and they form one of the most growing items in the German trade with the Transvaal. Consumers explain their preferenee by stating that the Germans manufacture a much purer chemical at present prices than can be obtained from the British producers. As the consumption of cyanide in gold mining is extending through the introduction of the dry-reduction process to poor ores, and also through the use of various forms of direct treatment, this would seem to be a serious matter for the British chemical industry. It is true that great attempts are being made to improve the methods of gold extraction by mercury, obviating the use of water and battery 'plates'; but where cyanide is applicable to the ores it has the great advantage of being a considerably cheaper chemical to employ than mercury. With the great development of gold mining in Western Australia and elsewhere, the consumption of cyanide would seem certain to largely increase, and it would be a misfortune if this expanding trade were secured by the Germans. An English Company was floated a short time ago to develop a process by which it was claimed cyanide of potassium could be produced at 10d. per lb., but it does not appear to have yet achieved any practical success."

GAS AND WATER COMPANIES' STOCK AND SHARE LIST (see ante, p. 308).

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	15 Apl.	10½	Alliance & Dublin 10 p. c.	25½–26½	..	3 19 3
100,000	10	,,	7½	Do. 7 p. c.	18–19	..	3 18 11
300,000	100	1 July	5	Australian (Sydney) 5% Deb.	108–110	..	4 10 11
200,000	10	12 June	5	Belgrano (B. Ayres), Limited	10–10½	..	4 15 3
100,000	Stck.	26 June	5	Do. 5 p. c. Deb. Stk	100–103	..	4 17 1
200,000	5	29 May	6½	Bombay, Limited	7¾–8¼	..	3 18 9
40,000	5	,,	6½	Do. New, £4 paid	5½–6	..	4 6 8
380,000	Stck.	13 Aug.	12	Brentford Consolidated	285–290*	+1	4 2 9
210,000	,,	,,	9	Do. New	215–220*	–½	4 1 9
50,000	,,	,,	5	Do. 5 p. c. Pref.	—	..	—
159,375	,,	12 June	4	Do. 4 p. c. Deb. Stock.	130–134	..	2 19 9
220,000	Stck.	27 Mar.	11	Brighton & Hove Original	247–252	..	4 7 3
208,820	,,	,,	8	Do. A Ord. Stk.	190–195	..	4 2 0
933,500	Stck.	27 Feb.	5	Bristol, 5 p.c. max.	128–133	+1	3 15 2
420,000	20	27 Mar.	11½	British	57½–58½	..	3 16 11
50,000	10	12 Mar.	11½	Bromley, Ordinary 10 p. c.	22½–23½	..	4 17 11
71,000	10	,,	8½	Do. 7 p. c.	19–20	..	4 5 0
500,000	10	29 Apl.	5	Buenos Ayres (New) Limited	10½–10¾	..	4 13 1
200,000	100	1 July	6	Do. 6 p. c. Deb.	102–105	..	5 14 3
150,000	20	15 July	8½	Cagliari, Limited	29–31	..	5 6 5
100,000	10	29 May	8	Cape Town & District, Ltd.	16½–17½	..	4 11 4
50,000	50	2 May	6	Do. 6 p. c. 1st Mort.	58–60	..	5 0 0
550,000	Stck.	15 Apl.	13½	Commercial Old Stock	345–350	..	3 17 2
165,000	,,	,,	10½	Do. New do.	260–265	..	3 19 3
165,000	,,	12 June	4½	Do. 4½ p. c. Deb. do.	149–152	..	2 19 2
800,000	Stck	12 June	13	Continental Union, Limited.	285–290	..	4 9 8
200,000	,,	,,	10	Do. 7 p. c. Pref.	220–225	..	4 8 11
51,600	Stck.	27 Feb.	14	Croydon Com'cial A 10 p. c.	—	..	—
163,400	,,	,,	11	Do. B 7 p.c.	—	..	—
535,000	Stck.	27 Feb.	5½	Crystal Palace Ord. 5 p.c. Stk	140–144	..	3 12 11
60,000	,,	,,	5	Do. 5 p.c. Pref.	—	..	—
486,090	10	15 July	11	European, Limited	26⅝–27½	..	4 0 0
354,060	10	,,	11	Do. £7 10s. paid	18–19	+½	4 6 11
5,746,590	Stck.	13 Aug.	12¾	Gaslight & Coke, A, Ordinary	313–318*	–¾	4 0 2
100,000	,,	,,	4	Do. B, 4 p. c. max.	110–115*	+2	3 9 7
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	300–310*	..	3 4 6
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	147–152*	–¾	3 5 9
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	212–217*	+¾	3 9 1
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	205–210*	+½	3 6 8
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	300–310*	..	3 4 6
476,000	,,	,,	6	Do. K, 6 p. c. Prf.	173–178*	+1	3 7 5
1,061,150	,,	12 June	4	Do. 4 p. c. Deb. Stk.	138–143	..	2 15 11
294,850	,,	,,	4½	Do. 4½ p. c. do.	153–158	..	2 16 11
908,000	,,	,,	6	Do. 6 p. c. do.	207–212	..	2 16 7
70,000	10	14 May	6	Hongkong & China, Limited	12½–13½	..	4 8 10
3,800,000	Stck.	14 May	12	Imperial Continental.	252–257	–1	4 13 4
376,400	100	1 Aug.	4	Do. 4 p. c. Debs. Red.	100–103	..	3 17 8
473,600	Stck.	13 Aug.	3½	Do. 3½ p. c. Deb. Stk ,,	108–110*	–¼	3 3 8
75,000	5	26 June	6	Malta & Mediterranean, Ltd.	6–6½	..	4 12 4
560,000	100	1 Apl.	5	Met. of Melbourne, 5 p. c. Deb.	115–118	..	4 4 10
250,000	100	,,	4½	Do. 4½ p. c. Debs.	110–112	..	4 0 4
541,920	20	12 June	5	Monte Video, Limited	16½–17½	..	5 14 3
150,000	5	29 May	8	Oriental, Limited	8½–8¾	..	4 11 5
135,000	5	,,	8	Do. New, £4 10s. paid	7½–7¾	..	4 12 10
15,000	5	,,	8	Do. do. 1879, £1 paid	1¾–2	..	4 0 0
60,000	5	12 Mar.	7	Ottoman, Limited	5–5½	..	6 7 3
420,000	100	1 May	6	People's Gas } 1st Mtg. Bds.	105–110	..	5 9 1
500,000	100	1 June	6	of Chicago } 2nd Do.	102–107	..	5 12 1
250,000	10	27 Mar.	8	San Paulo, Limited	13½–14½	..	5 10 4
5,475,000	Stck.	—	5 7/16	South Metrop., 4 p.c. Ord.	—	..	—
820,000	,,	15 July	5	Do. 5 p. c. Deb. Stk.	173–176	..	2 16 10
60,000	Stck.	12 Mar.	11½	Tottenham & Edmonton, A	250–255	..	4 10 2
60,000	,,	,,	8½	Do. B	—	..	—
170,380	10	29 May	10	Tuscan, Limited.	13½–14½	..	6 18 0
149,900	10	1 July	5	Do. 5 p. c. Debs. Red.	98–100	..	5 0 0

WATER COMPANIES.

746,123	Stck.	26 June	10½	Chelsea, Ordinary	345–350	..	2 18 7
150,000	,,	,,	5	Do. 5 p. c. Pref.	175–180	..	2 15 6
160,000	,,	,,	4½	Do. 4½ p. c. Pref. Stk., 1875	160–164	..	2 14 10
175,785	,,	27 Mar.	4½	Do. 4½ p. c. Deb. Stock	165–170	+7	2 12 11
1,719,514	Stck.	15 Apl.	7	East London, Ordinary	235–240	..	2 18 4
654,740	,,	26 June	4½	Do. 4½ p. c. Deb. Stk.	165–170	+10	2 12 11
100,000	,,	,,	3	Do. 3 p. c. Deb. Stk.	105–107	..	2 16 1
700,000	50	12 June	7½	Grand Junction, 10 p.c. max.	122–126	..	2 19 6
280,000	Stck.	27 Mar.	4	Do. 4 p. c. Deb. Stk.	152–157	+3½	2 10 11
708,000	Stck.	13 Aug.	12	Kent	345–350*	–1	3 8 7
160,000	,,	,,	7	Do. New, 7 p. c. max.	230–225*	+1½	3 2 3
1,043,800	100	26 June	7½	Lambeth, 10 p. c. max.	270–275	..	2 14 6
406,200	100	,,	7½	Do. 7½ p. c. max.	227–230	..	3 5 2
350,000	Stck.	27 Mar.	4	Do. 4 p. c. Deb. Stk.	152–157	+5	2 10 11
500,000	100	13 Aug.	12 3/10	New River, New Shares	433–438*	+½	2 18 11
1,000,000	Stck.	30 July	4	Do. 4 p. c. Deb. Stk.	157–160	..	2 10 0
902,300	Stck.	12 June	4	S'thwk & V'xhall, Ordinary	154–159	..	2 10 4
126,500	100	,,	4	Do. Do. 7½ p. c. Max.	150–155	..	2 11 7
489,200	Stck.	,,	5	Do. Do. 5 p. c. Pref.	175–180	+3	2 15 6
1,019,585	,,	15 Apl.	4	Do. 4 p. c. A Deb. Stk.	153–156	..	2 11 3
1,155,066	Stck.	12 June	10	West Middlesex	328–333	..	3 0 0
200,000	,,	,,	4½	Do. 4½ p. c. Deb. Stk.	165–170	+8	2 12 11

*Ex div.

Tunbridge Wells Water Supply.—At the last meeting of the Tunbridge Wells Corporation, a long report was submitted in regard to the water-rates and the need of revised borrowing powers; and the Council were asked to apply for a Provisional Order to increase the borrowing powers under the Water Act from £100,000 to £120,000, and so amend the Act as to enable the Council to make a contribution from the water-works account in aid of the general district rate. Alderman Delves suggested that the amount should be altered from £120,000 to £150,000; and this was agreed to.

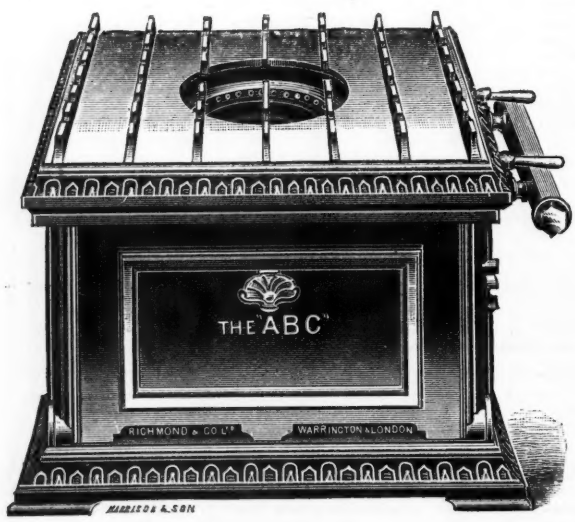
Bromley Gas Consumers' Company.—In the report to be presented by the Directors of this Company at the half-yearly general meeting next Thursday, it is stated that, though the quantity of gas made in the six months ending June 30 last was less by 2½ million cubic feet than in the corresponding period of 1895 (which was abnormally increased by the exceptional frost), it was nevertheless 9½ millions more than in the first half of 1894. The average increase is thus well maintained. Reference is made to the adverse condition of the residuals market which is now so general. The profit and loss account shows a balance of £6369, and the Directors will recommend the payment of the same dividend as before—viz., at the rates of 11½ and 8½ per cent. per annum. This will absorb £5892, and leave £477 to be carried forward.

Water-Works Extensions at Bolton.—A Local Government inquiry was held at Bolton on the 6th inst., in regard to an application made by the Corporation for sanction to borrow £15,290 for water-works purposes. The Inspector was Mr. Rienzi Walton, M.Inst.C.E., and the objects of the Corporation were explained by the Town Clerk (Mr. R. G. Hinnell). Under the Bolton Improvement Act of 1882, the Corporation were enabled to borrow £100,000 for water-works purposes, subject to the sanction of the Local Government Board. Towards this sum, the Corporation have already received power to raise money amounting to £35,613, of which £11,000 was expended in the purchase of lands forming part of the watershed; and the present application had reference to the acquisition of other lands forming part of the same area. Particulars of the proposed expenditure were submitted. There was no opposition; and at the close of the inquiry the Inspector, accompanied by the Town Clerk and the Water Engineer (Mr. R. H. Swindlehurst, M.Inst.C.E.) visited the lands in question.

Acetylene Gas as an Illuminant.—At the Winton and District Flower Show, held at Rush Corner, Bournemouth, on the 4th inst., two of the principal tents (about 200 feet long) were brilliantly lighted up with acetylene gas. Only eight burners were provided for each tent; and with a consumption of rather less than one cubic foot per burner per hour, it is reported that each gave an estimated luminosity of more than 200 standard candles. The colours of the flowers and leaves of shrubs and plants came out wonderfully distinctly; and the experiment was a complete success. The gas was obtained from the new patent generator of Messrs. Haviland, Holloway, Collier, and Murch, of Bournemouth, of the Acetylene Company, and was under the personal superintendence of their Engineer, Mr. W. H. Murch. The exhibition showed the complete adaptability of the gas to outdoor installations. It is claimed for the Company's generators that they are independent of continuous water supply; and we are informed that the Company are fitting up large works near Birmingham for their manufacture by an improved process and apparatus.

The Pollution of the River Dee.—At the meeting of the Chester Town Council last Thursday, the Sluices Committee recommended that the Council appoint three representatives to a conference of the counties within the watershed of the River Dee, with the view to making a joint application to the Local Government Board for a Provisional Order for the constitution of a Joint Committee to put into operation the Rivers Pollution Prevention Act, 1876, for the watershed of the Dee, with power for such representatives to agree with the other Councils concerned upon the basis of representation of the respective Councils on the proposed Committee, the amount of their respective contributions to the expenses, and any other matters in connection with the constitution of the Committee. Alderman W. H. Churton, in moving the adoption of the recommendation, said there could be no doubt that the fact of the Council being divided had largely to do with the defeat of the Sluices Bill. The water question was by no means disposed of, however, for the matter could not be allowed to drop. The Sluices Committee thought the proposed formation of a Joint Committee an excellent plan. It was held that they must get their water from an entirely different source, or that the Water Company should make arrangements to take the water from a part of the river which was outside tidal influence. Personally, he thought it would be a grievous mistake to take water from any other source. He hoped the Company would view the matter in a common-sense way, and suggest some course which would meet the difficulty, and be a proper settlement of the whole question. The motion was agreed to.

Stockton and Middlesbrough Water Supply.—At the monthly meeting of the Stockton and Middlesbrough Water Board on Monday last week, the Engineer (Mr. D. D. Wilson) reported that during the week ending the 4th ult. 70,891,000 gallons of water had been supplied to consumers; in the week ending the 11th, 70,252,000 gallons; in the week ending the 18th, 69,717,000 gallons; and in the week ending the 25th, 71,241,000 gallons. Mr. Wilson said the quantity supplied was not quite a "record" for the month, but it was for the quarter. The largest consumption in any one week for manufacturing purposes was 54,300,000 gallons, which was in 1890, when there were in operation at Stockton several works which had since been closed. Last week, the manufacturing consumption reached 53,874,000 gallons. The average weekly supply for the quarter had been 52,373,000 gallons—an increase of 2,000,000 gallons per week on 1890. The average weekly consumption for manufacturing purposes during the corresponding quarter of last year was 48,424,000 gallons. The average weekly consumption for domestic purposes was 16,814,000 gallons, as against 16,787,000 gallons in the corresponding period of 1895. When the Board first took over the works in 1879, the weekly manufacturing consumption averaged only 23,761,000 gallons. Alderman Hinton asked if any economies were being practised by manufacturers, because the rise in the consumption did not seem to be in proportion to the increased trade in the district as compared with 1890. Mr. Wilson said at some of the works they saved water by condensation; but it was not a general practice. Mr. M'Lauchlan remarked that the best index of the state of trade was the increase in revenue from water for domestic consumption. Alderman Bulmer agreed, and pointed out that, though the population of the district had risen by 50,000 or 60,000, the Board were supplying less water. This was due to the measures which had been taken to prevent waste and leakage.



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Messrs. Little and Graham, Limited, of Smethwick, have been entrusted by the North-Eastern Railway Company with the order for their new retort-house, with a bench of six beds of sevens. The firm have just added to their works a large new shop, provided with a 10-ton overhead traveller, and equipped with special tools for the economical manufacture of coal-carbonizing plant.

Barnet District Gas and Water Company.—At the meeting of this Company next Friday, the Directors will report a balance of £14,786 on the profit and loss account, out of which they will recommend dividends (less income-tax) for the half year ending June 30 last at the rate of 9 per cent. per annum on the "A" and "C" stocks, 8 per cent. per annum on the "B" stock, and £6 6s. per cent. per annum on the "D" capital—gas and water stocks.

The Government and the London Water Question.—The scarcity of water in the district of the East London Company has been brought under the special notice of the First Lord of the Treasury (the Right Hon. A. J. Balfour) by the local members of Parliament, who have addressed a letter to him expressing their conviction that the only manner in which a recurrence of the present trouble can be prevented, and possible disaster avoided, is for the whole supply of water in the Metropolis to be in the hands of one authority of a representative character, so that when scarcity arises in one district, it may be met from the supplies of others. They therefore press upon the Government the need of proceeding early next session (with a determination to pass it into law) with a Bill constituting such an authority. Mr. Balfour has replied that the Government are deeply sensible of the importance of the question to Londoners generally and to the East-end in particular; and they feel strongly that next session ought not to pass without a solution of the question being arrived at.

The London County Council and their Welsh Water Scheme.—Our readers are aware that Mr. T. Canning, Assoc.M.Inst.C.E., the Engineer and Manager of the Newport (Mon.) Gas Company, is a member of the Corporation of that town; and he occasionally testifies to his usefulness in that capacity by taking up questions other than those with which he might be supposed to be immediately concerned. For instance, at the meeting of the Town Council last Tuesday, he asked if the Parliamentary Committee had not been instructed to take action in resisting the proposals of the London County Council with regard to impounding the head-waters of the Usk for the supply of London. They desired to take 182 million gallons a day from that source; and it was of the most serious importance to the industrial, commercial, sanitary, and fishing interests of the county. He expressed the hope that there would be a combination of all the local authorities of Monmouthshire to resist the intentions of the London County Council; and he asked the Parliamentary Committee to give consideration to the subject. The Town Clerk replied that the matter had been referred to a Sub-Committee of the Water Committee; and he would call their attention to it. It is clear, from what has been already recorded on this subject, that the London County Council will encounter much local opposition to their project.

Extension of West Malling Gas Undertaking.—The West Malling Gas Company have decided to extend their undertaking so as to include Offham; and they have received the sanction of the local authoritie for breaking up the necessary roads.

End of the Gas Strike at Lisbon.—According to a telegram received through Reuter's Agency last Tuesday, the strike of gas workers at Lisbon, to which reference was made in the JOURNAL for that day, had been brought to an end by the Company conceding the demands of the men.

The Condition of the Leicester Water Supply.—The Mayor of Leicester (Mr. Alderman Wood) has announced that the recent experiences as regards the water supply have been most satisfactory. The consumption has been reduced to only 11·38 gallons per day per head of the population, or 500,000 gallons less than in the week ending the 1st. inst., owing to the holidays and the subsequent closing of the factories. Nearly a million gallons have been obtained and pumped into the mains from auxiliary sources; and this has reduced the drain on the reservoirs to less than 1½ million gallons a day. The stock of water at Bradgate and Thornton is about 284 million gallons; and the aggregate daily consumption has fallen to 2,456,284 gallons. The rainfall in the week ending the 8th inst. was only 0·3 inch; making the aggregate of the year at Thornton 9·89 inches, as compared with 13·13 inches in the previous year; and at Bradgate 10·3 inches, as contrasted with 13·76 inches. On the whole, therefore, the situation is more hopeful, though there is, of course, still the most imperative necessity for the greatest economy in the consumption.

Helsby Water Supply.—During the last few months the Helsby and District Water Company, Limited, have been supplying water by means of a temporary pump from a steel tubed well; the bore being 2¾ inches in diameter. This well yields 16,000 gallons a day of a fine quality of pure water. On the main road through the village, 4-inch and 3-inch pipes have been laid for upwards of 2000 yards; and about a mile of service-pipes on the private roads. The pipes are laid 3 feet deep, so as to be frost-proof. The Company are supplying about 80 houses. Cottages of £10 rateable value and under are charged 3d. per week, without meter, with free use of as much water as they want. Private arrangements are made with large consumers. In anticipation of an increased demand for water, the Company are now sinking a large well. It is 22 feet deep and 10 feet in diameter; and it is now ready for the commencement of boring. The tube will be 8 inches in diameter outside, and 7¼ inches inside; and the borehole will descend to a depth of 210 feet, to be steel tubed for more than half this length. A small spring has already been tapped at 30 feet; but it will be shut out by the tube, as only the deep waters out of the red sandstone are to be pumped into the pipes. The pressure at the present time is not regular; but when the new borehole and reservoir capable of holding 48,000 gallons are completed, the service of water will be constant. On the lower part of the pipes, the pressure will be 130 lbs. per square inch, or the highest in Cheshire. The Company expect that their scheme will be completed in three or four months.

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No.	External Dimensions.			Oven.			Hot Plate.	No. of Boiling-Burners	Price.	White Enamelled Crown extra.
	High.	Wide.	Deep.	High.	Wide.	Deep.				
401	18½	13½	11½	14	11	9½	13½ by 11½	1	28/6	—
402	24½	15½	15	18	11	11	15½ ,, 15	2	40/-	2/6
403	30	18	17	19	11	11	18 ,, 17	2	45/-	2/6
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404	If fitted with Enamelled-Lined and Jacketted Door and Fire-Brick Crown, as adopted by The London Gaslight and Coke Co.								55/-	2/6

Any of these Cookers, except No. 401, can be fitted with Griller at an extra charge of 2/6; but the adoption of the Griller is not recommended for use with Prepayment Meters.

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Another Explosion in an Electric Light Box.—An explosion took place in the electric light service-box at the corner of Vere Street and Oxford Street about 9.30 last Wednesday evening. Fortunately, no one was hurt; but the pavement was thrown up, and a large crowd assembled.

Gas and Water Supply and Electric Lighting at Lancaster.—The Borough Accountant of Lancaster has issued his accounts for the financial year 1895-6. The Gas Department handed over £1500, the proportion of profits for the year 1894-5, to the borough fund. Last year's profits (£1099) were transferred to the reserve fund, which now stands at £11,926—within £75 of the statutory limit. The net profits of the Water Department were £3290; whereas in the year preceding they were £4429—a difference of £1139, accounted for by increased expenditure for maintenance and diminished income from water supplied by meter. The reserve fund now stands at £12,000. The Electricity Department was worked last year at a loss of £539; the loss on the previous year being £374. The two sums—in all, £913—have been charged to the borough fund account. The loss on the current year is expected to be not more than £282.

The Reigate Town Clerk and the East Surrey Water Bill.—An attempt was made by Mr. Viall, at the last meeting of the Reigate Town Council, to punish the Town Clerk (Dr. C. J. Grece) for his conduct in connection with the East Surrey Water Bill. He proposed a motion in the following terms; "That, owing to his conduct in connection with the East Surrey Water Bill, the Town Clerk be and is hereby requested either to resign his office as Town Clerk or cease to be a Director of Public Companies." In a carefully prepared speech, Mr. Viall severely criticized the attitude of the Town Clerk and Alderman Bugden with reference to the Bill. The motion was seconded; and then the Town Clerk spoke in his own defence. He said there was not an article in his code of duties which made it incumbent upon him to place before the Council a copy of any Bill, public or private, which might be pending in Parliament. The duty devolved upon each member of the Council; and it was in conformity with this practice that he had never obtained a copy of any Bill without instructions from the Council. He had done no more in the case of the East Surrey Water Bill than he did with regard to other Bills which had been promoted in Parliament. Several councillors having spoken for and against the motion, it was put and negatived by ten votes to seven.

The Proposed Purchase of the Abingdon Gas-Works by the Corporation.—The Committee appointed to consider the proposed purchase of the Abingdon Gas Company's undertaking by the Abingdon Town Council have reported that it is not expedient for the Corporation to proceed with the matter; and the scheme has consequently been abandoned.

Electric Lighting Schemes at Bury St. Edmunds.—The Town Council of Bury St. Edmunds, having decided to introduce the electric light into the borough, are now engaged in considering some novel proposals. In the first place, Alderman Gough offers to give a guarantee that the lighting of the borough shall not be any expense whatever to the ratepayers; he holding himself responsible for any loss, and receiving whatever profit may be made. For some reason, this offer does not meet with an open-arm reception. The next proposal emanates from Alderman Lake, who wants to know if members of the Town Council cannot convert themselves into a company to take over the electric lighting of the town, giving a guarantee to the ratepayers against loss for twenty years, and receiving the profits during that period. The Town Clerk has been instructed to seek the advice of a Parliamentary Agent on this matter.

Abingdon Water-Works Extension.—At Abingdon, last Wednesday week, Major C. H. Luard, R.E., completed an inquiry on behalf of the Local Government Board in respect of the proposed extension of the water-works, by inspecting the works. The application of the Abingdon Town Council was at first for power to borrow £2000; but this sum has been increased to £3000. The Town Clerk (Mr. Bromley Challenor), in furnishing the details of the scheme, said the works were commenced in 1878, when a sum of £10,000 was expended on them. They originally consisted of a reservoir and a syphon out of a sump. In 1893, the syphon was extended; but in 1894 and in 1895, owing to the dry summers, there was great difficulty in getting water. The average demand was 120,000 gallons per day, and up to the present rather more than £1000 had been expended on the extension works; and it was estimated that another £2000 would be necessary to complete the scheme. The loan debt on the town was £28,447. The Town Council had money in Consols, and they proposed to sell some out, and apply it to the water-works. The Inspector said that the Town Clerk had better put this scheme in writing, and send it direct to the Local Government Board. In the meantime, there being no opposition, he would prepare his report.

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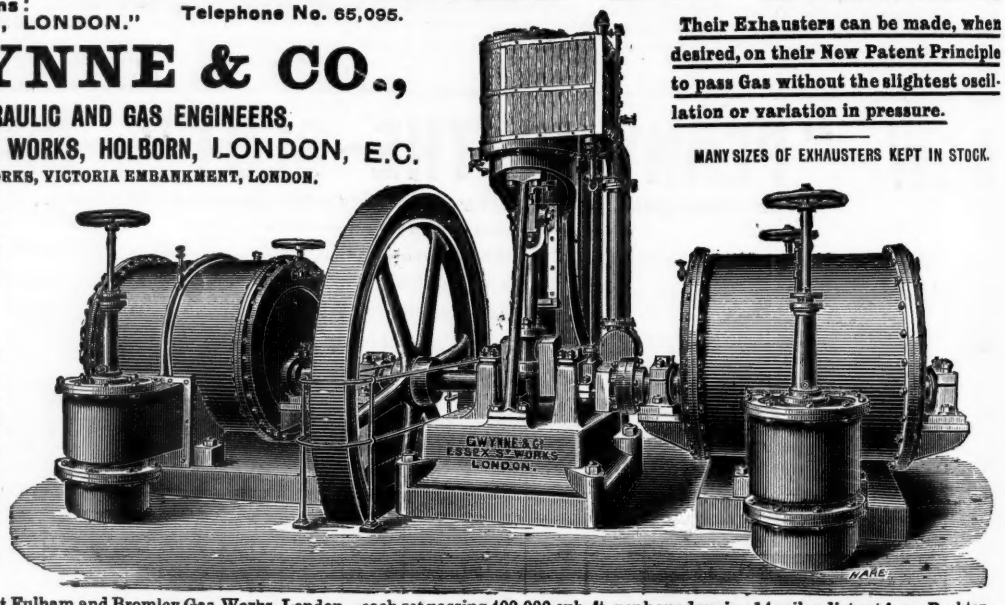

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COUNTY BOROUGH OF BIRKENHEAD.

TO OIL IMPORTERS AND DISTILLERS.

THE Corporation of Birkenhead are prepared to receive TENDERS for the supply of about 1500 Tons of RUSSIAN SOLAR DISTILLATE GAS-OIL, delivered free into their Oil Stores, at Ilchester Wharf, Birkenhead Docks, on or before the 31st of October, 1896, as the Gas Engineer may direct. The Oil to have a specific gravity of not over ·875 at 60° Fahr., with a minimum flash point of 200° Fahr., and must be homogeneous, containing no residuum (pitch or masute). The Corporation are also willing to consider offers of other Gas-Oils, if the quality and grade and full particulars are given.
Samples of the Oils tendered for must be sent to the Gas Engineer, at the Gas-Works, and properly labelled with the name of the Firm, and the number and name of the Oil corresponding to the tender.
Any further information may be obtained from the Gas Engineer, Mr. T. O. Paterson, M.Inst.C.E., Gas-Works, Thomas Street, Birkenhead.
Tenders, stating price per ton, sealed and endorsed "Tender for Gas-Oil," to be sent in to me not later than Five o'clock in the afternoon of Friday, the 28th of August, 1896.
The Corporation do not bind themselves to accept the lowest or any tender.
By order,
ALFRED GILL,
Town Clerk.
Town Hall, Birkenhead,
Aug. 12, 1896.

CANNEL, COAL, ETC.

JOHN ROMANS & SON, EDINBURGH, Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS CAST-IRON PIPES, and other APPARATUS for GAS and WATER WORKS.
Prices, &c., will be forwarded on application to No. 80, ST. ANDREW SQUARE, EDINBURGH, / NEWTON GRANGE, NEWBATTLE, DALKEITH, } SCOTLAND.

TO EMPLOYERS, COMPANY DIRECTORS, ETC.

THE LAW GUARANTEE & TRUST SOCIETY, LD., GUARANTEES FIDELITY.

SEND for complete Prospectus containing Balance-Sheet, Copy of Policy, &c., &c. Mortgage, Debenture, License, and Contingency Insurance.
Head Office: 49, CHANCERY LANE, LONDON, W.C.

HYDRATED OXIDE OF IRON.

PREPARED from pure Iron.
Two or three times as rich as Bog Ore.
Strong action on Sulphuretted Hydrogen.
To be used alone, but will increase activity of other Oxides.
Less than half the price of Bog Ore.
Can be lent on hire.
Write for tabulated results.
READ HOLLIDAY AND SONS, LIMITED, HUDDERSFIELD.

ECONOMY IN PURIFICATION.

INCREASE the Efficiency of your PURIFIERS by adopting CRIPPS'S PATENT BYE-PASS VALVE in the lower Tiers of Sieves. Practical Experience proves their Economy. Engineers are repeating orders after thorough trial.
References and Particulars can be obtained from the Makers—
C. & W. WALKER, Midland Iron-Works, Donnington, near Newport, SALOP.
And J. EVERY & SON, Phœnix Iron-Works, LEWES.

BOROUGH OF WIDNES.

THE Corporation invite Tenders for the purchase of from 600 to 700 Tons of GAS TAR from their Gas-Works, for the Twelve Months ending Sept. 30, 1897.
Forms of Tender, and conditions of Contract, may be obtained from Mr. Isaac Carr, Assoc.M.Inst.C.E., Gas-Works, Widnes.
Tenders, endorsed "Tar," to be delivered to the undersigned not later than the 29th inst.
The highest or any tender not necessarily accepted.
H. S. OPPENHEIM,
Town Clerk.
Town Hall, Widnes,
Aug. 15, 1896.

TO COAL MERCHANTS.

THE Urban District Council of Milton-next-Sittingbourne, Kent, invite TENDERS for the supply and delivery of 1000 Tons of GAS COALS, to be delivered at such times and in such quantities, within One Year from the date of the acceptance of the Tender, as the Manager of the Gas-Works shall direct.
Forms of Tender, and all necessary particulars as to the conditions of the Contract, can be obtained from the Manager at the Office at the Works.
Sealed tenders, endorsed "Tender for Coals," and addressed to the Chairman of the Milton-next-Sittingbourne Urban District Council, must be sent or delivered to me at my Office on or before Monday, Aug. 24 inst.
The Council do not bind themselves to accept the lowest or any tender, and any tender not on the form supplied will not be considered.
WM. PARHAM,
Clerk to the Council.
Milton-next-Sittingbourne,
Aug. 12, 1896.

STOCKTON-ON-TEES CORPORATION.

TENDERS FOR GAS COAL.

THE Gas Committee of the above Corporation invite TENDERS for the supply, in whole or in part, of 52,000 Tons of GAS COAL for the Year ending Sept. 30, 1897.
Particulars and Form of Tender can be obtained on application to the undersigned at the Gas-Works.
Tenders, sealed and endorsed "Tenders for Gas Coal," to be sent in not later than Noon of the 26th day of August, 1896, addressed to M. B. Dodds, Esq., Town Clerk, Stockton-on-Tees.
The Gas Committee do not bind themselves to accept the lowest or any tender.
WILLIAM FORD,
Engineer and Manager.
Gas-Works, Stockton-on-Tees,
Aug. 6, 1896.

Price 5s. per 100.
THE USE OF
GAS LIME IN AGRICULTURE.
By Dr. A. VOELCKER.
A 4pp. Leaflet for Distribution among Farmers and others.

LONDON: Walter King, 11, Bolt Court, Fleet St., E.C

TOTTENHAM AND EDMONTON GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that the ANNUAL ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at the Offices, Willoughby Lane, Tottenham, on Saturday, the 29th day of August inst., at Half-past Three o'clock in the afternoon precisely, to receive the Report of the Directors and Statement of Accounts for the Half Year ended the 30th of June, 1896, to declare Dividends for the same period, and for the election of two Directors and an Auditor for the ensuing Year; also to consider the NOTICE OF MOTION given at the Half-Yearly Meeting held on the 29th of February last, as follows: "That, at the next General Meeting of Proprietors, the Salary of the Secretary be considered, with a view to its increase;" and for transacting General Business.

The TRANSFER BOOKS WILL BE CLOSED for the Consolidated Stocks from the 14th to the 29th of August inst., both days inclusive.

By order of the Board,
JAMES RANDALL,
Secretary.

Offices of the Company:
Willoughby Lane, Tottenham,
Aug. 7, 1896.

BROMLEY GAS CONSUMERS' COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of this Company will be held at the Bell Hotel, Bromley, Kent, on Thursday, the 20th day of August inst., at Six o'clock p.m. precisely, to receive the Report of the Directors, the Balance-Sheet certified by the Auditors, to declare Dividends, to elect an Auditor, and for General Purposes.

The TRANSFER BOOKS WILL BE CLOSED from the 6th to the 20th of August, 1896, both days inclusive.

By order of the Board,
HENRY W. AMOS,
Secretary.

Offices at the Works, Bromley,
Kent, Aug. 6, 1896.

Fcap. 4to, Cloth, price 7s. 6d., post free

Practical Photometry.

By William Joseph Dibdin, F.I.C., F.C.S.

LONDON: Walter King, 11, Bolt Court, Fleet St., E.C.

ISSUE OF STOCKS AND SHARES BY AUCTION UNDER PARLIAMENTARY POWERS.

MR. ALFRED RICHARDS undertakes the issuing by Auction of GAS AND WATER SHARES under Parliamentary Powers.

He also holds MONTHLY SALES of GAS AND WATER SHARES at the Auction Mart, Tokenhouse Yard, E.C.

Terms for the issuing of Capital, and also for offering to auction Gas and Water Shares, and all Particulars relating thereto, may be had of Mr. Alfred Richards.

Offices: 18, FINSBURY CIRCUS, E.C.

PRICE'S COKE & COAL BARROW

effecting a great saving of time, labour, and expense.

For Particulars, Price, &c., apply to Mr. EDWARD PRICE, 119, Queen's Road, FINSBURY PARK, N.

Prices are Reduced.

INCANDESCENT STREET LIGHTING, &.

IMPORTANT TO GAS COMPANIES, LIGHTING AUTHORITIES, RAILWAY COMPANIES, &c.

Great Saving in Mantles, Chimneys, Attendance, &c.

ECONOMICAL, EFFICIENT, SATISFACTORY.

APPLICABLE TO EXISTING LAMPS.

MINIMUM OF SKILLED LABOUR REQUIRED IN FIXING.

Successful results guaranteed in all Situations.

FULL PARTICULARS ON APPLICATION TO

THE ANTI-VIBRATION INCANDESCENT LIGHTING COMPANY, LIMITED,

12 & 14, WESTGATE ARCADE, BRADFORD, YORKS., ENGLAND.

Telegraphic Address: "CANDESCENT, BRADFORD."

JAMES MILNE & SON, LTD.,

MILTON HOUSE WORKS, EDINBURGH.

60, HOLBORN VIADUCT, LONDON. | 111, ST. VINCENT STREET, GLASGOW. | 48, WELLINGTON STREET, LEEDS.

MILNE'S PATENT

PREPAYMENT DRY METER.

MOST COMPACT ATTACHMENT IN THE MARKET.

SAME HEIGHT AS AN ORDINARY METER.

CAST-IRON ATTACHMENT COVER WITH EXTRA LARGE MONEY-BOX, WHICH IS WITHDRAWN WHILE OPENING DOOR.

ABSOLUTELY POSITIVE IN ACTION.

THE WHOLE MECHANISM ALWAYS IN GEAR.

NO SPRINGS TO GET OUT OF ORDER.

NO PAWLS TO SLIP OUT OF GEAR.

ACCURACY IN PRICE-CHANGING SECURED.

400 Cub. Ft. CAN BE PAID FOR AT ONE TIME.

THE INCANDESCENT GAS-LIGHT COMPANY, LIMITED,

— *v.* —

"DE MARE" COMPANY.

THE INCANDESCENT GAS-LIGHT COMPANY, LIMITED.

— *v.* —

"SUNLIGHT" COMPANY.

THE INCANDESCENT GAS-LIGHT COMPANY, LIMITED, HEREBY GIVE NOTICE, as follows:—

VALIDITY. The Company's Patent has been declared VALID ON ALL POINTS after a Fifteen-Day Trial.

NATURE OF INVENTION. The Invention was described by Mr. Justice Wills as a "PIONEER INVENTION."

SCOPE OF PATENT. The Patent HAS BEEN GIVEN A WIDE CONSTRUCTION; and it was held that the protection given by it was not confined to Mantles manufactured according to the particular prescriptions set out in the Specification.

SHAPE OF MANTLE. The Judge held that a Mantle, even if made in a different form or shape (such as the "De Mare" Fringe or Plume), IS STILL AN INFRINGEMENT of the "Welsbach" Patent.

"DE MARE" JUDGMENT. Judgment for an INJUNCTION, WITH FULL COSTS, has been given against the "De Mare" Incandescent Gas-Light System.

"SUNLIGHT" JUDGMENT. Judgment was given AGAINST the "Sunlight" Incandescent Gas-Lamp Company, Limited, on the question of the VALIDITY OF THE PLAINTIFFS' PATENT.

"SUNLIGHT" MANTLES. Last about 100 hours.

"WELSBACH" MANTLES. Last about 1000 hours.

"Sunlight" Mantles BURN DOUBLE THE GAS to produce the same candle power as the Incandescent Gas-Light Company's Mantles.

Users of "Sunlight" Mantles are applying to the Incandescent Gas-Light Company to REPLACE THEM BY THEIR OWN MANTLES.

WARNING. Users of the Incandescent Gas-Light Company's Mantles upon "Sunlight" Burners ARE INFRINGERS OF THE COMPANY'S PATENT, AND WILL BE AT ONCE PROCEEDED AGAINST.

Certificates of the Validity of the Company's Patent have been granted both by Mr. Justice Romer and Mr. Justice Wills entitling the Company to Solicitor and Client Costs, which will, IN ALL CASES, BE RIGOROUSLY ENFORCED.

COSTS.

INFRINGERS. The Incandescent Gas-Light Company WILL TAKE PROCEEDINGS AGAINST ALL PERSONS INFRINGING THEIR PATENT, WHETHER

MAKERS,
WHOLESALE DEALERS,
RETAILERS,
or
USERS.

Users of the Company's Mantles upon Burners not sold by the Company ARE INFRINGERS.

"LIMITED LICENSE" WARNING. Judgments have already been obtained against such users from Mr. Justice Chitty, Mr. Justice Stirling, Mr. Justice Kekewich, and Mr. Justice North.

FAITHFULL & OWEN,
11, Victoria Street,
Westminster.

Solicitors to the Incandescent Gas-Light Company, Limited.

April, 1896.

NOTICE.

The attention of the METEOR INCANDESCENT LIGHTING COMPANY, LIMITED, having been again called to the Advertisements inserted in various papers by the Incandescent Gas-Light Company, Limited, of Palmer Street, Westminster, to the effect that the "Meteor" Incandescent Gas-Lights are an Infringement of their Patents, and that they will bring Actions for Infringement against all persons found dealing in any manner with such Lights, the METEOR INCANDESCENT LIGHTING COMPANY, LIMITED, HEREBY GIVE NOTICE that they are advised that the "Meteor" Incandescent Lights in no way infringe any of the Patents of the Incandescent Gas-Light Company, Limited, that an action has been commenced to restrain such threats, and that they are PREPARED TO FULLY INDEMNIFY ALL PURCHASERS, DEALERS, AGENTS, and USERS of their Lights against any Legal Proceedings on the part of the Incandescent Gas-Light Company, Limited.

WILSON, BRISTOWS, & CARPMAEL,
1, Copthall Buildings, London, E.C.,

Solicitors to the Meteor Incandescent Lighting Company, Limited, of 35, New Broad Street, London, E.C.

Nov. 30, 1895.

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on Application.

UNEQUALLED.
Gas Companies are solicited to try Samples of the
MIRFIELD
BLACK BED GAS COAL.
Prices and Analysis on application.
MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY.

NEWBATTLE CANNEL.
Highest Results in Gas, & Excellent Coke.
QUOTATIONS ON APPLICATION TO
THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

JAMES OAKES & Co.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road,
CITY ROAD, LONDON, N.,
Manufacture and keep in Stock at their Works (also large stock in London)
PIPES and CONNECTIONS, 1¼ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.
NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts and covers, and rendering leakage impossible.

HOLMSIDE GAS COALS.
PRESENT DAILY PRODUCE OVER 4000 TONS.
LATEST ANALYSIS—By CHARLES PHILLIPS, Gas Examiner to Rotherham Corporation.

Yield of Gas Per Ton . . 11,205 Cubic Feet.
Illuminating Power, 16 7/10 Stand. Sperm. Candl.
Coke (of good & pure quality) 13¾ Cwt. Per Ton.
Sulphur . . . . A little over 1 Per Cent.
Ash . . . . . Under 1 Per Cent.
Tar . . . . . 163 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor 108 Lbs. (Avoir.) Per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR PELTON GAS COALS.
PRESENT DAILY PRODUCE AVAILABLE 2500 TONS.
RESULTS OF DIFFERENT ANALYSES:—

Yield of Gas Per Ton . . 10,500 Cubic Feet.
Illuminating Power . 17 Stand. Sperm Candl.
Coke (of excellent quality) . 13½ Cwt. Per Ton.
Sulphur . . . . . 1·13 Per Cent.
Ash . . . . . 1·34 Per Cent.
Tar . . . . . 180 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor 94½ Lbs. (Avoir.) Per Ton.

The HOLMSIDE and SOUTH MOOR COALFIELD possesses *a very great quantity of the best Coal;* and, whilst other Coal-Fields are becoming exhausted, this one is only being opened out, so that *the quality* of both the HOLMSIDE COALS, and the SOUTH MOOR COALS *may be relied upon for all practical purposes.*

These Coals may be bought through the Principal Merchants in England, or direct from

MR. MARK ARCHER,
HOLMSIDE AND SOUTH MOOR OFFICES,
NEWCASTLE-UPON-TYNE.

TROTTER, HAINES, & CORBETT,

Brettell's Estate

FIRE-CLAY & BRICK WORKS,

STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.

Proprietors of

BEST GLASSHOUSE POT & CRUCIBLE CLAY.

Shipments Promptly and Carefully Executed.

London Office: R. Cull, 34, Old Broad St., E.C.

HUNTER'S

OXIDE OF IRON.

James Hunter, Miner, and Shipper of

NATURAL IRISH BOG ORE.

This Estate yields the finest and most uniform quality in Ireland; and the quality is guaranteed.

Samples and Prices on application.

5, PRINCES STREET, PORT GLASGOW.

Telegrams: "Hunter, Port Glasgow."

Established 1872.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for

CANNEL & COAL.

TYNE

BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	17·8 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

For Prices and complete Analysis, apply to

THOS. W. DANCE & SONS,

Coal Owners, Newcastle-on-Tyne

or

E. FOSTER & CO.,

12, John Street, Adelphi, London, W.C.

HEBBURN MAIN GAS COALS.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·4 candles.
Coke	68 per cent.

For Prices, f.o.b. Ship or Delivered by Rail, apply to

THE WALLSEND & HEBBURN COAL COMPANY, LTD.

B Lombard Street,

NEWCASTLE-ON-TYNE.

W. Richardson, Fitter.

THE SILICA FIRE-BRICK COMPANY,

OUGHTIBRIDGE, near SHEFFIELD,

MANUFACTURE

SILICA BLOCKS, BRICKS, AND CEMENT

OF SUPERIOR QUALITY

FOR GAS-FURNACES.

Trade Mark: "SILICA."

These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their

GREATER DURABILITY,

Strongly recommended where EXCESSIVE HEATS have to be maintained.

THORNLEY GAS COALS

WORKED BY THE

WEARDALE IRON & COAL Co., Ld.

OUT OF THEIR

THORNLEY AND WHEATLEY HILL COLLIERIES.

Analysis made by

Messrs. J. & H. S. PATTINSON, *May 28, 1895.*

Yield of Gas per Ton	10,500 Cub. Ft.
Illuminating Power	16·9 Candles.
Coke (of good quality)	67·5 per Cent.
Sulphur	0·58 „
Ash	2·73 „

For Price, &c., apply to the

WEARDALE IRON & COAL Co., Ld.

QUAYSIDE, NEWCASTLE-ON-TYNE.

THE DRUM

FOR PUMPING AIR, WATER, SEMI-FLUIDS, &c.

See Advertisement in last and next issue.

LONDONDERRY GAS COALS

FROM THE

MARQUIS OF LONDONDERRY'S COLLIERIES,

COUNTY OF DURHAM.

Available output up to 5000 tons per day. Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by Mr. John Pattinson, F.C.S., F.I.S.

For Prices and Particulars, apply to

S. J. DITCHFIELD,

SEAHAM HARBOUR, COUNTY OF DURHAM.

THOMAS TURTON AND SONS, Limited,

SHEAF WORKS, SHEFFIELD,

MANUFACTURERS OF

FILES OF BEST QUALITY

FOR ENGINEERS.

STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES, SPANNERS, RATCHET BRACES, LIFTING JACKS, ANVILS, VICES, AND ENGINEERS' TOOLS GENERALLY.

London Office:

90, CANNON STREET, E.C.

BOLDON GAS COALS.

Worked by THE HARTON COAL CO., LTD.

Output about 3000 tons per day.

Analysis—

Yield of Gas per ton	10,500	Cubic Feet.
Illuminating Power	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

Boldon Gas Coals are supplied under contract to

The Gaslight and Coke Company, South Metropolitan Gas Company, Commercial Gas Company, Imperial Continental Gas Association, European Gas Company, L'Union des Gaz (the Continental Union Gas Company), Crystal Palace District Gas Company, Danish Gas Company, Bombay Gas Company, San Paulo Gas Company, Alliance and Dublin Consumers' Gas Company, Ipswich Gaslight Company, Newcastle Gas Company, Sunderland Gas Company, South Shields Gas Company, and to many other Companies at Home and Abroad.

For Prices, &c., apply to the

HARTON COAL COMPANY,

LIMITED,

Newcastle-on-Tyne.

W. H. PARKINSON,

Fitter.

STOURBRIDGE RETORTS AND FIRE-BRICKS.

BEST QUALITY.

KING BROTHERS, STOURBRIDGE.

[See Illustrated Advertisement, Aug. 4, p. 240.]

INCANDESCENT GAS-BURNERS,

Acknowledged to be the best in the Market.

Being already too much engaged in the working of the German Patent, we intend to **SELL OUR ENGLISH PATENT No. 8149, of 1896** (see *Journal of Gas Lighting*, London, July 14, 1896); and hereby beg to invite offers for same.

KOMET,

Fabrik Patentierter Mischapparate für Wirthschaftliche und Gewerbliche Zwecke,

Wilhelmstr. 43, BERLIN.

Wrought-Iron
TUBES
And Fittings and Accessories.

LAMBERT BROS., WALSALL,
MANUFACTURERS OF
WROUGHT-IRON TUBES & FITTINGS for GAS, WATER, & STEAM,
BRASS GAS-FITTINGS, GAS-VALVES, STEAM & WATER VALVES, TOOLS, &c., AND OF
WARNER'S PATENT MARKET GAS STAND-PIPE.
LONDON: LAMBETH BRASS & IRON CO., Short Street, LAMBETH.

R. & A. MAIN,
GAS COOKING AND HEATING STOVES,
92, ALDERSGATE STREET, KINNING PARK,
LONDON, E.C., & GLASGOW.

JOHN BROWN & CO., LTD., SHEFFIELD.
Proprietors of
ALDWARKE MAIN, CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.
ALDWARKE MAIN GAS COAL
Analysis: 12,600 Feet of 19-Candle Gas per Ton.
Value in Pounds of Sperm, 820·80.
VERY FREE FROM IMPURITIES.
TELEGRAMS: "ATLAS, SHEFFIELD."

MOBBERLEY & PERRY
STOURBRIDGE.
Manufacture & supply best quality of
Gas Retorts (SEGMENTAL, HORIZONTAL, or INCLINED.)
Special Bricks & Blocks for GENERATOR & REGENERATOR FURNACES.
FIRE BRICKS, LUMPS, & TILES, BLUE STAFFORDSHIRE VITRIFIED BRICKS FOR PAVING, &c., &c.
EVERY REQUISITE FOR GAS-WORKS. Retort Setters sent to any part of the Kingdom.
Contractors for the erection of Retort-Benches complete.
London Agents:
BALE & HARDY, Gas Engineers and Contractors, BRIDGE HOUSE, 181, QUEEN VICTORIA STREET, E.C.

SERVICE CLEANER.

HUTCHINSON BROTHERS,
GAS ENGINEERS, &c.,
MANUFACTURERS OF IMPROVED
WET AND DRY GAS-METERS.
STATION-METERS. LAMP-METERS.
TEST GASHOLDERS & GENERAL GAS-APPARATUS.
BRASS MAIN & LAMP TAPS. UNIONS, FERRULES, &c.
The "Falcon" Lamplighter's Torch. Service Cleaners.
SYPHON AND OTHER PUMPS.
Wood and Wrought-Iron Purifier-Grids. Scrubber Boards.
WET AND DRY METERS REPAIRED.
FALCON WORKS, BARNSLEY.
Telegrams: "HUTCHINSON BROS., BARNSLEY."

LAMP SERVICE CLEANER

WILLEY & CO.,

GAS ENGINEERS,

LONDON & EXETER.

Offices: HAVEN ROAD, EXETER.

MANUFACTURERS OF

GASHOLDERS, ROOFS, BRIDGES, GIRDERS,

AND EVERY DESCRIPTION OF

GAS APPARATUS.

MAKERS OF THE LIVESEY WASHER.

AGENTS FOR THE MAXIM CARBURETTOR.

Engineering Works: ST. THOMAS, EXETER.

Manufacturers of WET and DRY GAS-METERS of unsurpassed excellence.

Patent Penny-in-the-Slot AUTOMATIC METER with the latest improvements. Fraud Proof, Perfect in Action, Accurate in Registration, Instantaneous Price Adjustment *in situ* without Change Wheels.

Meter Factories: JAMES STREET, EXETER, and 248, KINGSLAND ROAD, LONDON, N.

Metropolitan Agent:

FRANK ACLAND, M.Inst.M.E., M.Inst.C.E., 70, Cheapside, E.C.

MANUFACTURERS OF

GAS-FITTINGS

IN ENDLESS VARIETY.

CHANDELIERS, BRACKETS, PENDANTS, MAIN COCKS, &c., &c., &c.

SPECIAL FITTINGS FOR THE AUTOMATIC BUSINESS.

Brass Foundries and Works: ST. THOMAS, EXETER.

Telegraphic Address: "WILLEY, EXETER." Telephone 132. Established over 30 Years.

ALEX. C. HUMPHREYS, M.Inst.C.E. A. G. GLASGOW, M.E.

MESSRS. HUMPHREYS & GLASGOW

Have constructed their EUROPEAN type of

CARBURETTED WATER-GAS PLANT

At the following Gas-Works:—

Copenhagen	700,000 Cub. Ft.	Brighton	1,500,000 Cub. Ft.
Belfast	1,700,000 „	Preston	1,500,000 „
Glasgow	300,000 „	Southport	750,000 „
Brussels	700,000 „	Bath	1,000,000 „
Liverpool	3,500,000 „	New York	1,200,000 „
Tottenham	750,000 „	Newburgh, N.Y.	350,000 „
Santiago	400,000 „	Tottenham (Second Contract)	750,000 „
Swansea	750,000 „	St. Joseph, Mo.	750,000 „

And have now under Contract:—

Belfast (Second Contract)	4,500,000 Cub. Ft.	Edinburgh	2,000,000 Cub. Ft
Shanghai	225,000 „	Stockton-on-Tees	500,000 „
Winchester	200,000 „	Stockport	500,000 „
Hoylake	125,000 „	Norwich	1,000,000 „
Manchester	3,000,000 „	Guildford	350,000 „
Brussels (Second Contract)	700,000 „	Syracuse, N.Y.	850,000 „
Holyoke, Mass.	600,000 „	Bordentown, N.J.	125,000 „

In addition to which the previous Installations of The Gaslight and Coke Company under this System have a total capacity of 10,000,000 cubic feet per diem.

9, Victoria Street, London, S.W. — Telegrams: "EPISTOLARY, LONDON." — *United States Office, 64, Broadway, New York.*

THE WHESSOE FOUNDRY CO., LTD., DARLINGTON.

Established 1790.

MANUFACTURERS OF EVERY DESCRIPTION OF GAS PLANT,

FROM

RETORTS

TO

GASHOLDERS

FOR WHICH THEY HAVE THE NEWEST AND MOST MODERN MACHINERY.

GASHOLDERS CAN BE MADE OF ANY DIAMETER AND PUT TOGETHER AT THE WORKS.

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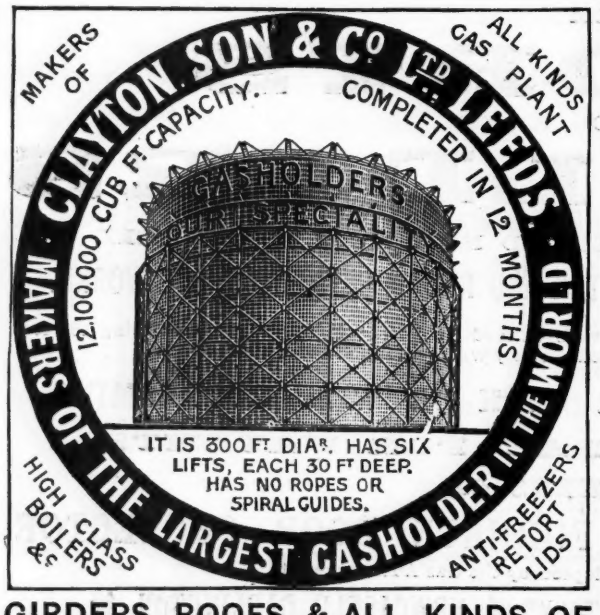
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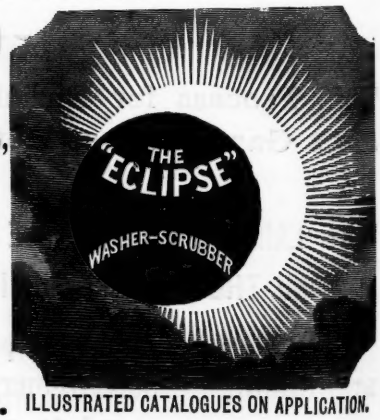

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